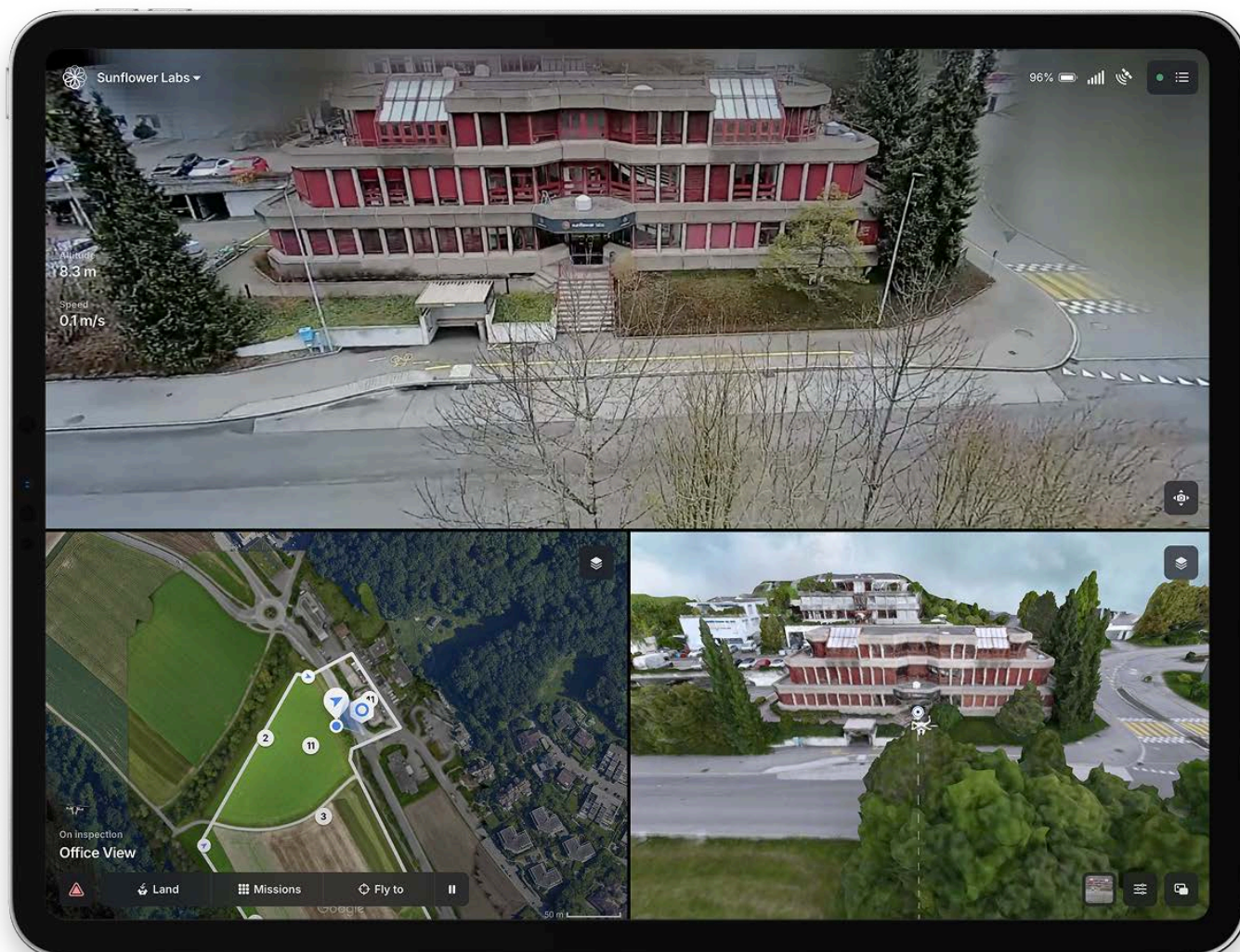




Operations Manual

Beehive 1

BH1-SYS-UOM / Rev E

Table of Contents

1. Introduction.....	6
2. Limitations.....	7
2.1. Operational Limitations.....	7
3. Emergency Procedures and Emergency Response.....	8
3.1. Emergency Procedure Philosophy.....	8
3.2. Emergency Procedures.....	9
3.2.1. Emergency Procedures - Loss of Flight Control - Runaway Bee.....	9
3.2.2. Emergency Procedures - Inflight Fire - Battery Fire.....	10
3.2.3. Emergency Procedure - Unresponsive Bee.....	10
4. Abnormal Procedures.....	11
4.1. Automatic Abnormal Procedures.....	11
4.2. Manual Abnormal Procedures.....	12
5. Normal Procedures.....	13
5.1. Normal Procedures - Preflight Checks.....	13
5.1.1. Normal Procedures - Preflight Check - Environment.....	13
5.1.2. Normal Procedures - Preflight Check - System.....	14
5.1.3. Normal Procedure - Preflight Checks - Perimeter.....	14
5.2. Normal Procedures - Inspection Mission.....	15
5.3. Normal Procedures - Patrol Mission.....	16
5.4. Normal Procedures - Fly-to Mission.....	17
5.5. Normal Procedures - Follow Mission.....	18
5.6. Normal Procedures - Return to Land.....	19
5.7. Normal Procedures - Air Traffic Monitoring.....	20
5.8. Normal Procedures - Post-flight Checks.....	21
5.9. Normal Procedures - Pilot Handover.....	21
6. Performance Information.....	22
7. System Description and Operation.....	23
7.1. System Overview.....	23
7.2. UAS Operational Volume.....	25
7.3. Types of Operations.....	27
7.4. Getting Started.....	29
7.5. System Information Bar.....	30
7.5.1. UAS Identifier and Selector.....	30
7.5.2. Hive Menu Button.....	31
7.5.3. Bee Status Indications.....	33
7.5.3.1. Battery Status Indication.....	33
7.5.3.2. C3-Link Indication.....	35
7.5.3.3. GPS Signal Level Indication.....	36
7.5.4. Bee Flight Mode and Status Annunciation.....	37
7.6. Flight Data and Planning Indication.....	40
7.6.1. Flight Planning Information.....	41
7.6.2. Altitude Indication.....	42
7.6.3. Attitude Indicator.....	42

7.6.4. Collision Detection.....	43
7.6.5. Landing Beacon Detection.....	44
7.7. Maps and Views.....	45
7.7.1. 2D Map.....	45
7.7.2. 3D Map.....	45
7.7.3. Map Menu and Shortcuts.....	46
7.7.3.1. 2D Map Menu and Shortcuts.....	46
7.7.3.2. 3D Map Menu and Shortcuts.....	47
7.7.4. Split View.....	48
7.7.5. PiP.....	49
7.8. System Failure Detection and Indication.....	51
7.8.1. Alerts.....	51
7.8.2. Notifications.....	53
7.8.3. Mission Execution Failure.....	54
7.8.4. System Status.....	54
7.8.4.1. System Status Indication on Control Station.....	54
7.8.4.2. Hive Status Indication on Control Panel.....	55
7.9. Advisory Status.....	57
7.9.1. Weather Status.....	57
7.9.2. Flight Advisory Status.....	59
7.9.3. Flight Advisory Overrides and Acknowledgements.....	60
7.9.3.1. Overrides.....	60
7.9.3.2. Acknowledgments.....	60
7.9.3.2.1. Acknowledgement of a Flight Advisory.....	61
7.9.3.2.2. Modifying a Flight Advisory Acknowledgement.....	62
7.9.3.2.3. Withdraw a Flight Advisory Acknowledgement.....	63
7.10. Detect and Avoid (DAA) - Optional.....	64
7.10.1. General.....	64
7.10.2. Functioning.....	65
7.10.2.1. The Proximity Bands.....	65
7.10.2.2. DAA Maneuvers.....	67
7.10.2.2.1. Unsafe Modes and Commands during Threat Level Warning and Critical.....	67
7.10.2.3. Types of Air Traffic.....	68
7.10.2.3.1. Colors.....	68
7.10.2.4. List of Air Traffic.....	69
7.11. System Controls.....	70
7.11.1. Bee Controls.....	70
7.11.1.1. Physical Power On/Off Pushbutton.....	70
7.11.1.2. Bee Power Controls.....	70
7.11.1.3. Bee Mission Controls.....	71
7.11.1.3.1. Inspection Mission Controls.....	72
7.11.1.3.2. Patrol Missions.....	74
7.11.1.3.3. Fly-to Missions.....	76
7.11.1.3.4. Follow Missions.....	78

7.11.1.4. Landing and Pause Controls.....	79
7.11.1.4.1. Land Button.....	79
7.11.1.4.2. Pause Button.....	79
7.11.1.4.3. Resume Button.....	80
7.11.1.5. Camera Controls.....	81
7.11.1.5.1. Snapshot Button.....	82
7.11.1.5.2. Rotate Control Buttons.....	82
7.11.1.5.3. Forward and Back Buttons.....	82
7.11.1.5.4. Altitude Control Buttons.....	82
7.11.1.5.5. Zoom Control Buttons.....	82
7.11.1.6. Save Location.....	83
7.11.1.7. Camera Settings.....	84
7.11.1.7.1. Camera Profile.....	84
7.11.1.7.2. Night Mode.....	85
7.11.1.7.3. Video Control.....	85
7.11.1.7.4. Video Quality.....	87
7.11.1.8. Emergency Controls.....	88
7.11.2. Events.....	90
7.11.3. Hive Controls.....	93
7.11.3.1. Control Panel.....	93
7.11.3.2. Hive Power and Subsystem Controls.....	93
7.12. System Integration and Automation.....	94
7.12.1. System Integration.....	94
7.12.1.1. External Triggers.....	94
7.12.1.2. External API.....	96
7.12.1.2.1. Inspection Request.....	96
7.12.1.2.2. Patrol Request.....	96
7.12.1.2.3. Fly to Request.....	97
7.12.1.2.4. Follow Request.....	98
7.12.1.2.5. Target Position.....	98
7.12.2. System Automation.....	99
7.12.2.1. Configuring Jobs.....	99
7.12.2.1.1. Scheduled Patrols.....	100
7.12.2.1.2. Trigger Investigation.....	103
7.12.2.2. Active Jobs.....	105
7.12.2.3. Disabling Jobs.....	106
7.12.2.4. Editing Jobs.....	106
7.12.2.5. Deleting Jobs.....	106
7.12.2.6. Skipping Jobs.....	107
7.12.2.7. Standby Pilot.....	107
7.13. Direct Remote Identification.....	108
7.13.1. General.....	108
7.13.2. Upload of UAS Operator Registration Number - Europe Only.....	108
7.13.3. Upload of UA Registration Number - United States and Japan Only.....	108

7.13.4. Pilot Location.....	108
7.14. Privacy Blurring.....	109
7.15. Settings.....	110
7.15.1. Power & Controls.....	110
7.15.1.1. Power.....	110
7.15.1.2. Hive Controls.....	111
7.15.1.3. Bee Controls.....	112
7.15.2. Remote ID.....	113
7.15.2.1. Set Pilot Position.....	113
7.15.2.1.1. Takeoff Location.....	113
7.15.2.1.2. Dynamic.....	114
7.15.2.1.3. Manual (Fixed).....	114
7.15.3. Maintenance.....	115
7.16. History.....	116
8. Troubleshooting.....	117
8.1. Alerts.....	117
8.1.1. Emergency Alerts.....	117
8.1.2. Warning Alerts.....	119
8.1.3. Caution Alerts.....	128
8.1.4. Informational Alerts.....	129
8.2. Bee State Failures.....	132
8.3. Mission Execution Failures.....	133
9. Reporting Accidents, Incidents and Mishaps.....	137
10. Safety Guidelines.....	138
10.1. Flight Operations.....	138
10.2. Battery Safety Notice.....	139
11. Template Emergency Response Plan (ERP).....	140
12. References.....	144
13. Acronyms/Terms.....	144
14. Record of Revisions.....	147

1. Introduction

This Operations Manual has been prepared by Sunflower Labs. The purpose of this manual is to:

- provide the necessary operating limitations, procedures, performance, and systems information the UAS pilot needs to safely and efficiently operate the Beehive 1 system
- serve as a comprehensive reference for use during UAS pilot training for the Beehive 1 system
- serve as a review guide for use in recurrent training and proficiency checks
- provide necessary operational data from the ConOps and the operational approval process to ensure that all binding legal requirements are satisfied
- establish standardized procedures and practices

This manual is prepared for the owner/operator specifically for the Beehive 1 Unmanned Aircraft System (UAS) and contains operational procedures and information, which apply only to these UAS.

This manual is not suitable for use for any other UAS.

2. Limitations

2.1. Operational Limitations

Environmental Conditions		
ENV#1	Maximum allowable wind speed	6.0 m/s / 13.4 mph
ENV#2	Maximum allowable gust speed	9.0 m/s / 20.1 mph
ENV#3	Operational temperature range	-10°C to +40°C / 14°F to 104°F
ENV#4	Maximum allowable precipitation	1.5 mm/10 min / 0.059 in/10 min
ENV#5	Flying in severe weather (e.g. hail, tornadoes, sandstorms, lightning, hurricanes) is prohibited.	
ENV#6	Operations above 3000 m AMSL are prohibited	

Operator	
OPR#1	The RPIC must hold a proof of competency according to local regulations
OPR#2	This UAS operations manual does not contain information related to the compliance with security (privacy and data protection) and environmental protection requirements. Therefore those must be obtained separately.
OPR#3	The RPIC must be of a clear state of mind.

sUAS Operation	
OPS#1	Only one pilot is allowed to operate the system at a time.
OPS#2	Operating the sUAS from a moving land or water-borne vehicle or moving aircraft is prohibited.
OPS#3	Hovering over roads is strictly prohibited. Crossing roads shall be carried out perpendicularly, in order to minimize the crossing time.
OPS#4	UAS operation is prohibited when assembly of people is present within the operational volume or adjacent area.

sUAS and its Subsystems	
SYS#1	Attaching any additional payload to the UAS is strictly prohibited. Note: - The sUAS is not equipped with a sub-system for releasing payload, therefore dropping objects of any kind is not possible. - The only approved payload is the security camera which is permanently fixed to the airframe and part of the approved operational configuration, therefore the sUAS can not be used for transportation of goods of any kind (e.g. dangerous goods).
SYS#2	The Detect and Avoid System (DAA) is able to detect cooperative traffic only.

3. Emergency Procedures and Emergency Response

This section describes the recommended procedures for coping with various types of emergencies or critical situations.

3.1. Emergency Procedure Philosophy

There are only a few emergency situations that require pilot intervention. These situations and the reactions that the pilot should take are presented in the following diagram.

Before taking any action, the pilot must ensure that the Bee is not already performing the appropriate automatic contingency procedure.

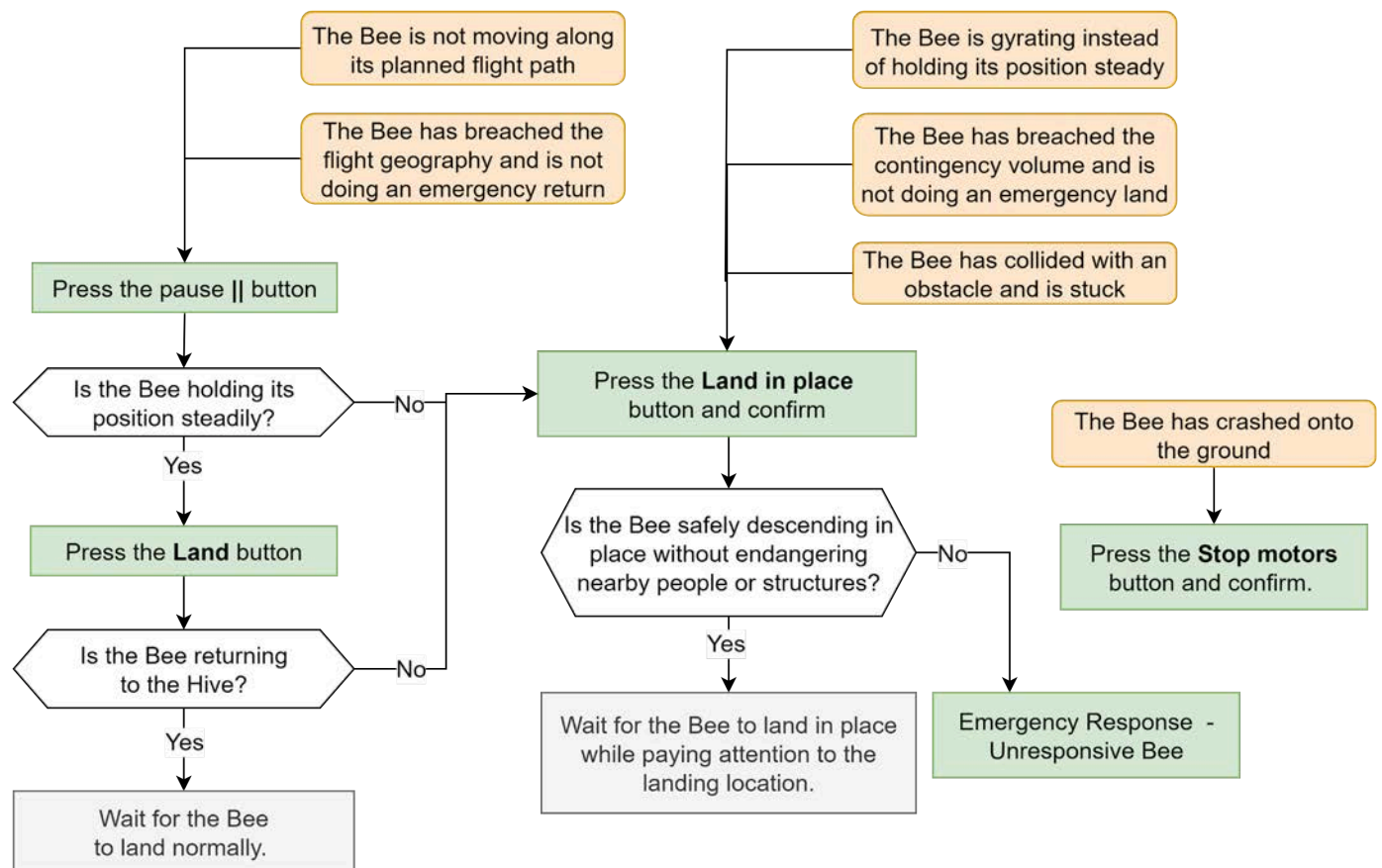


Figure 3-1 - Emergency procedure flowchart

After initiating any emergency procedure, consult the UAS maintenance manual [\[Ref. 2\]](#) before commanding any other flights or contact Sunflower Labs for support.

3.2. Emergency Procedures

Emergency procedures are to avoid or at least minimize the hazard to third parties in the air or on the ground or for the emergency recovery of the Bee. If the emergency procedure does not result in an escalation of the emergency, follow the operation-specific emergency response plan (ERP).

3.2.1. Emergency Procedures - Loss of Flight Control - Runaway Bee

In case a runaway Bee condition is observed on the CS or suspected or annunciated via the **CONTINGENCY VOLUME VIOLATION** warning indication.

- || (pause) button on the CS **PRESS**
 - If the Bee stops moving horizontally
 - **Land** and then confirm **PRESS**
 - Flight Mode Annunciation **Returning** **CHECKED**
 - The Bee moving towards the Hive **CHECKED**
 - The Bee stops above the Hive **CHECKED**
 - Flight Mode Annunciation **Landing** **CHECKED**
 - The Bee is landing **CHECKED**
 - If the Bee is hovering but is not responding to Landing command
 - Emergency Procedure - Unresponsive Bee **EXECUTE**
 - If the Bee still keeps moving horizontally
 - **Land in place** button on CS **PRESS**
 - Flight Mode Annunciation **Landing fallback** **CHECKED**
 - The Bee is descending slowly **CHECKED**
 - If Bee still keeps moving horizontally without descending
 - ERP **EXECUTE**

Note:

- *The flight mode annunciation might differ slightly. Monitor and confirm the correct flight path.*
- *Under BVLOS operation the horizontal position of the Bee can be judged by the payload camera indication or Bee position indication on the CS.*
- *When visual contact with Bee is available, then utilize both the direct visual contact and the payload camera indication for judging Bee location.*

3.2.2. Emergency Procedures - Inflight Fire - Battery Fire

In case a battery fire is observed or suspected.

- | | |
|---|----------------|
| • (pause) button on the CS | PRESS |
| • The Bee stops moving horizontally | CHECKED |
| • Land button and confirm | PRESS |
| • Flight Mode Annunciation Returning | CHECKED |
| • The Bee moving towards the Hive | CHECKED |
| • The Bee stops above the Hive | CHECKED |
| • Flight Mode Annunciation Landing | CHECKED |
| • The Bee is landing | CHECKED |
| • ERP | EXECUTE |

3.2.3. Emergency Procedure - Unresponsive Bee

In case of unresponsive Bee.

- | | |
|---|----------------|
| • Check for people within the expected crash zone | CHECKED |
| ○ If people are present: | |
| ■ Alert the people of the Bee malfunction | NOTIFY |
| ■ Evacuate the people from the zone | EXECUTE |
| ■ Prepare for the Bee crash | EXECUTE |
| ○ If people are not present: | |
| ■ Prepare for the Bee crash | EXECUTE |
| • ERP | EXECUTE |

4. Abnormal Procedures

The purpose of this section is to describe the recommended procedures for handling malfunctions of equipment, or other abnormalities, that are not of an emergency nature or involve a potential emergency that may be deferred.

The overall failure indication and system/pilot response philosophy is described in section [System Failure Detection and Indication](#).

The majority of failures are handled by the system automatically without the need for pilot intervention.

4.1. Automatic Abnormal Procedures

The automatic abnormal procedures are performed by the system and require no pilot intervention. Depending on the failure, the system may initiate a return to land in the Hive, a high altitude return to the Hive, or a landing in place.

Table 4-1 shows the type of failures and the automatic response from the system.

A description of System Failure Detection can be found in Section [System Failure Detection and Indication](#).

During these procedures the pilot is not expected to intervene or take any action other than confirming that the automatic abnormal procedure is properly executed by the system itself.

Whenever an automatic reaction is in progress an alert describing the automatic reaction is shown in the alert bar.

Note: In the event of a C3 link loss, the system will show an alert indicating that the Bee is performing an automatic return to the Hive. This alert may be misleading, should the alert be caused by a crash of the Bee.

Note: Should the Bee not enter the appropriate automatic abnormal procedure when one of these failures occurs, follow the emergency response philosophy in section [Emergency Procedure Philosophy](#).

Failure Description	Automatic Procedure	Flight Mode Annunciation
A failure that leads to a reduction in safety margin but does not directly affect the Bee’s navigation performance	The Bee performs an automatic return to the Hive along the normal return route and lands in the Hive.	Returning followed by Landing
A failure that leads to a reduction in safety margin and negatively affects the Bee’s navigation performance	The Bee performs an emergency return to the Hive at the ceiling of the planning volume (an altitude over the property that is obstacle free) and will attempt to land in the Hive.	Returning Fallback

A failure that leads to a reduction in safety margin and negatively affects the Bee's navigation performance to a level that makes navigating back to the Hive unsafe	The Bee performs an emergency landing at its current location with a controlled vertical descent rate. The Bee will not make an attempt to land in the Hive.	Landing Fallback
---	---	------------------

Table 4-1 - List of automatic abnormal procedures

4.2. Manual Abnormal Procedures

The malfunctions listed in this section require manual pilot interaction in order to maintain safe operation.

System Failure Indication	Failure Mode Description	Required pilot action
none		

Table 4-2 - List of manual abnormal procedures

5. Normal Procedures

This section describes the recommended procedures for the conduct of normal operations.

5.1. Normal Procedures - Preflight Checks

Preflight checks shall be performed before each flight.

5.1.1. Normal Procedures - Preflight Check - Environment

Before each flight verify:

- | | |
|---|----------------|
| • Verify that the weather conditions are within limits [Limitations] : | CHECKED |
| • Ground Risk (no assembly of people in Operational Volume area) | CHECKED |
| • Before the first flight of the day, verify if DABS, NOTAM or RPAS restrictions apply to the area of operations. | CHECKED |

Note: The system automatically checks for flight restrictions, but in order to assure that even the latest changes are taken into consideration a manual check of the DABS (CH only) / NOTAM / RPAS restrictions is required.

5.1.2. Normal Procedures - Preflight Check - System

Before each flight verify:

- | | |
|--|----------------|
| • No Pre-flight built in test (BIT) failure (amber or red) is detected | CHECKED |
| • No Bee failure indication (amber or red) is present | CHECKED |
| • The system status is green and is Ready to fly | CHECKED |
| • Obstacle map accurate and complete | CHECKED |
| • Geocage configured correctly | CHECKED |
| • Control Station hardware and software operational | CHECKED |
| • Control Station is permanently powered or its battery is properly charged | CHECKED |
| • Bee Battery charge level is sufficient to support the planned mission duration | CHECKED |
| • C3 link signal strength is good | CHECKED |
| • GPS signal quality is good | CHECKED |
| • Hive roof is free to move, not blocked by snow or any items | CHECKED |
| • Remote ID is not reporting an error | CHECKED |

5.1.3. Normal Procedure - Preflight Checks - Perimeter

- | | |
|--|----------------|
| • No person is present in the safety exclusion zone around the Hive | CHECKED |
| • Road crossings are planned so that the time over the road is minimized (perpendicular to the road axis, maximum ground speed, top of the planning volume). | CHECKED |

5.2. Normal Procedures - Inspection Mission

In order to perform an inspection mission, the desired pre-defined location can be selected from the 2D map, the 3D map, or the mission selection menu.

From the 2D or the 3D map:

- Select the location by clicking it on the map **SELECTED**

or

- Select the **Missions** button **SELECTED**
- In the popup, select the **Inspect** tab **SELECTED**
- From the list of locations, select the desired one **SELECTED**

then

- The selected location is shown in the preview window **CHECKED**
- Select the **Inspect Location** button **SELECTED**
- Monitor the Bee flight path during operation **COMPLETED**
- Monitor area overflown for assemblies and gatherings of people **COMPLETED**

If assemblies/gatherings of people detected:

- Command the Bee to **Land** **COMPLETED**

If required:

- Select other location(s) to inspect **SELECTED**

Otherwise:

- Initiate Normal Procedures - Return to Land **STARTED**

5.3. Normal Procedures - Patrol Mission

In order to perform a patrol mission

- | | |
|--|------------------|
| • Select the Missions button | SELECTED |
| • In the popup, select the Patrol tab | SELECTED |
| • From the list of patrols, select the desired one | SELECTED |
| • The selected patrol is shown in the popup | CHECKED |
| • Select the Start Patrol button | SELECTED |
| • Monitor the Bee flight path during operation | COMPLETED |
| • Monitor area overflown for assemblies and gatherings of people | COMPLETED |

If assemblies/gatherings of people detected:

- | | |
|----------------------------------|------------------|
| ○ Command the Bee to Land | COMPLETED |
|----------------------------------|------------------|

If required:

- | | |
|--|-----------------|
| ○ Select other location(s) to inspect | SELECTED |
| • After completing the patrol, the Bee automatically returns to the Hive | CHECKED |

5.4. Normal Procedures - Fly-to Mission

In order to perform a fly to mission

- | | |
|--|------------------|
| • Select the Fly to button | SELECTED |
| • Fly to mode is active | CHECKED |
| • In the 2D or 3D map, double-click on the desired location to select it | SELECTED |
| • The fly to marker appears in the desired location | CHECKED |
| • Monitor the Bee flight path during operation | COMPLETED |
| • Monitor area overflown for assemblies and gatherings of people | COMPLETED |

If assemblies/gatherings of people detected:

- | | |
|----------------------------------|------------------|
| ○ Command the Bee to Land | COMPLETED |
|----------------------------------|------------------|

If required:

- | | |
|--|-----------------|
| ○ Double-click another location in the 2D or 3D map,
or double-click the desired location in the video window | SELECTED |
|--|-----------------|

Otherwise:

- | | |
|---|------------------|
| ○ Initiate Normal Procedures - Return to Land | COMPLETED |
|---|------------------|

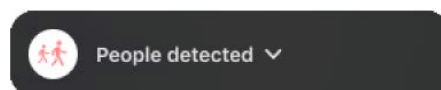
5.5. Normal Procedures - Follow Mission

This feature is only available if the **People Following** feature is enabled in the **Optional System Features** list in the **Settings**.

A follow mission can either be executed when the Bee is already in flight and when a person is detected in the video from the Bee camera or it can be executed when the system receives a Target over the REST API [\[Ref. 3\]](#).

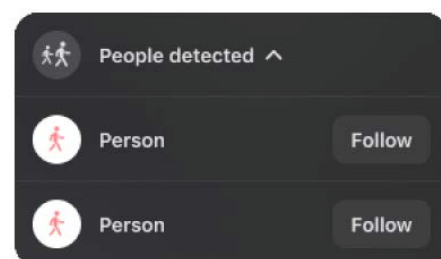
- The **People detected** popup appears

CHECKED



- From the list of people choose the one to follow and click follow

CLICKED



- The **Follow person** popup appears
- To discontinue the people following, select the **Stop** button
- Monitor the Bee flight path during operation
- Monitor area overflown for assemblies and gatherings of people

CHECKED

SELECTED

COMPLETED

COMPLETED

If assemblies/gatherings of people detected:

- Command the Bee to **Land**

COMPLETED

If required:

- Select other missions

SELECTED

Otherwise:

- Initiate Normal Procedures - Return to Land

COMPLETED

5.6. Normal Procedures - Return to Land

In order to command the Bee to land:

- | | |
|---|-----------------|
| • Select the Land button | SELECTED |
| • Select the Land in the popup to confirm | SELECTED |
| • The Bee is moving towards the Hive and the flight mode shows Returning | CHECKED |
| • The Bee stops above the Hive and the flight mode changes to Landing | CHECKED |
| • The Bee descends to the Hive and lands | CHECKED |

Note: *The Bee can be commanded to return to land in the Hive at any moment of any mission type.*

5.7. Normal Procedures - Air Traffic Monitoring

- Continuously monitor air traffic in the vicinity of the operational volume.
 - If **traffic is detected** and **sufficient time** is available, initiate **Land**

Land and then confirm	SELECTED
Flight Mode Annunciation Returning	CHECKED
The Bee moving towards the Hive	CHECKED
The Bee stops above the Hive	CHECKED
Flight Mode Annunciation Landing	CHECKED
The Bee is landing	CHECKED
 - If **traffic is detected** and there is **not sufficient time** for landing the Bee in the Hive then initiate **Land in place**.

Land in place button on CS	SELECTED
Flight Mode Annunciation Landing Fallback	CHECKED
Bee is descending slowly	CHECKED

NOTE

WHILE MONITORING THE AIRSPACE AREA WITHIN A 7 KM RADIUS AROUND THE OPERATIONAL VOLUME ON THE TRAFFIC DISPLAY:

The following definitions apply:

Traffic requiring no immediate action - Informational

- Disregard any traffic at a distance of larger than 5 km / 3.1 mi.
- Monitor traffic observed at a distance of less than 5 km / 3.1 mi.

Traffic detected and sufficient time is available - Caution

- If monitored traffic below 2000 ft AGL is detected (either GPS altitude or pressure altitude) within the range of 2 km / 1.2 mi.
→ command the Bee to **Land** in the Hive.

Traffic detected and no sufficient time for landing the Bee in the Hive - Warning

- If for whatever reason the traffic is **first detected (spotted)** at an altitude of less than 2000 ft AGL (either GPS or pressure altitude) within the 2 km / 1.2 mi radius.
→ command the Bee to **Land in place**

5.8. Normal Procedures - Post-flight Checks

Post-flight checks shall be performed after each flight.

- Log the flight in the record of flights

CHECKED

5.9. Normal Procedures - Pilot Handover

The CS shows who is currently in command of the Bee in the top status bar. It will either say **<RPIC name> is piloting** if it isn't you that is piloting at the moment.

In order to take control of the Bee from another RPIC:

- The correct Hive system is selected
- Select the **Take Control** button

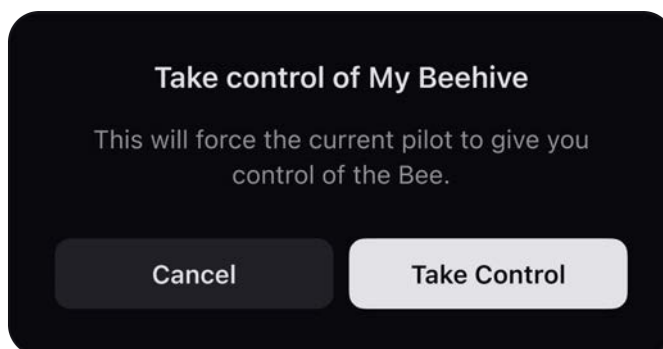
CHECKED

SELECTED



- Confirm that you want to take control

SELECTED



- Check that you are the pilot-in-command.
The **[Firstname Lastname] piloting** is no longer showing.

CHECKED

6. Performance Information

This section contains all performance information required by the aviation authorities and any additional performance and related information that might be relevant for the operator/pilot.

Parameter	Value
MTOM (Battery Included):	1.59 kg / 3.51 lbs
Dimensions (Including propeller guards)	48 cm x 48 cm x 20.9 cm / 18.9 in x 18.9 in x 8.2 in
Propeller Size	22.9 cm / 9 in
Cruise Speed	4 m/s / 8.9 mph (limited)
Ascent Rate	3 m/s / 6.7 mph
Descent Rate	1 m/s / 2.2 mph
Maximum Service Ceiling AMSL	3000 m
Operational Flight Time	15 minutes (+5 min. safety reserve)
Wind Speed Resistance	6.0 m/s / 13.4 mph
Gust Resistance	9.0 m/s / 20.1 mph
Operating Temperatures	-10°C to 40°C / 14°F to 104°F
Hover Accuracy	30 cm / 11.8 in
GPS	uBlox ZED F9P multi-band, multi-constellation, RTK
Camera Sensor	Sony IMX385
Camera FOV	100° (h), 50° (v)
Image Resolution	Full HD
Minimum Bandwidth	2 Mb/s
Video Latency	< 250 ms when on the local network
Obstacle Avoidance Range	6 m / 19.7 ft
Max Transmission Distance	> 1000 m / 3280 ft (unobstructed)
Battery Capacity	4000 mAh
Charge Time (for a 10 minute flight)	20 minutes
Max Charging Power	150 W

Table 6-1 - General Specification and performance

7. System Description and Operation

7.1. System Overview

The Beehive 1 system is a drone-in-a-box Unmanned Aircraft System (UAS) system that is permanently installed over a property and is ready for flight at a moment's notice. It consists of a ground station (GS), called the Hive, an unmanned aircraft (UA), called the Bee, and a control station (CS) on a mobile device or computer. A cloud service allows remote operations of the UAS.

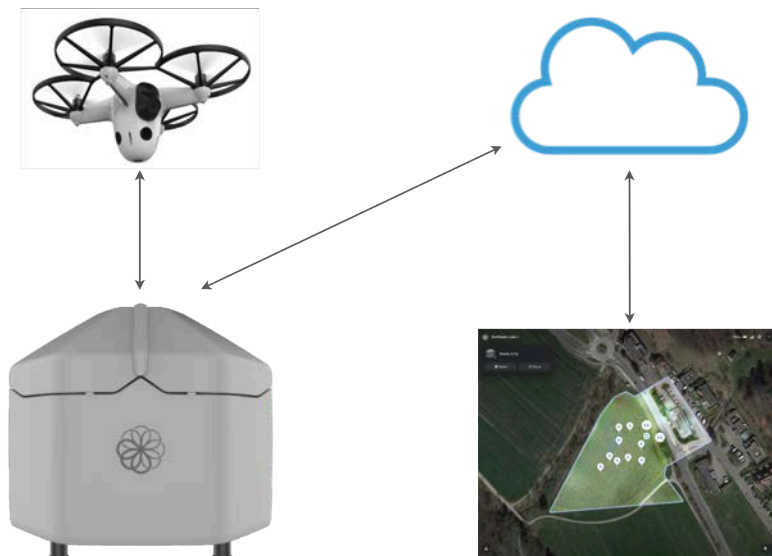


Figure 7-1 - Beehive 1 System Block Diagram

The Beehive 1 system is designed to operate in a tight operational volume over a property. The Bee navigates within a known 3D obstacle map of the property to predefined and tested locations on the property.

The Bee performs fully-automated flights and requires very little pilot interaction to perform its intended operations. The remote pilot is more of an observer of a flying camera with emergency controls, such as emergency landing procedures and complete power system shutdown.

The Bee is housed in a Hive outside, performs continuous pre-flight checks while landed and is charged and protected from the elements by the Hive. The Hive plans the flights and monitors weather and airspace conditions.

From the CS, the remote pilot can send the Bee to predefined locations on the property, send the Bee on a predefined patrol over the property, or click on the map to send the Bee to look at that location (see [Types of Operations](#)).

All flight planning is done in a very tight flight planning volume over the property, excluding any obstacles on the property. The contingency volume is tightly wrapped around the flight geography. In case the Bee ever leaves the contingency volume, the system automatically initiates an emergency landing procedure.

The system simplifies remote operation of the Bee as much as possible and the fully-automated Bee removes the need for a human in the loop for the most part. Flight inspection locations and patrol routes

over the property are preconfigured and flight operations are contained in a tight operational volume above the property.

Operations are carried out by a single remote pilot using the CS on a computer or mobile device to operate a single Bee. The pilot must be familiar with the operating limitations, operating procedures and the emergency response plan.

Although the system is capable of performing flight in a “fully automated” manner, the remote pilot has the ability to maintain control of the Bee at all times, except in case of loss of the command, control and communication (C3) link, in which case the Bee will respond automatically with a return to the Hive.

7.2. UAS Operational Volume

The operational volume of the UAS is very tightly contained over the property.

The planning volume is defined to be the volume in which all flights are planned by the flight planning software. The sides of the planning volume are defined by the property perimeter in most operations. In some cases, the installer might choose to make this planning area smaller than the property perimeter. Adjustment of this planning volume might be required in certain installations to ensure that the ground risk buffers are appropriate.

All known obstacles on the property are excluded from this planning volume including horizontal and vertical safety buffers (expanded obstacle). This safety buffer is 2 meters / 6.6 feet in the horizontal and 3 meters / 9.8 feet in the vertical direction from the object. Figure 7-2 illustrates these buffers.

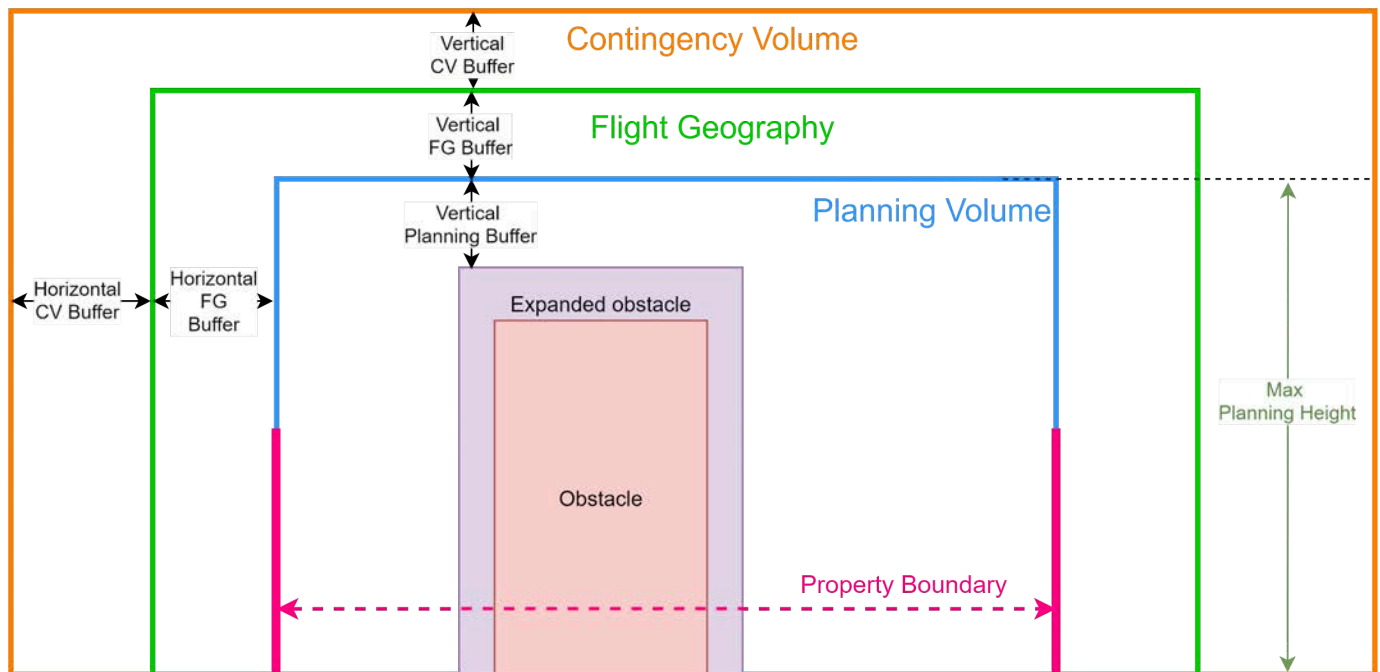


Figure 7-2 - UAS Operational Volume

The planning volume height is the height at which the UAS performs an emergency return to the Hive. This height is 3 meters / 9.8 feet above the highest obstacle plus the 3 meters / 9.8 feet vertical safety buffer to ensure adequate safety margins during an emergency return. All UAS missions are planned below this height.

Parameter	Value
Horizontal Obstacle Expansion	2 m / 6.6 ft
Vertical Obstacle Expansion	3 m / 9.8 ft
Horizontal Planning Boundary	Property Boundary
Vertical Planning Buffer	3 m / 9.8 ft
Horizontal Flight Geography Buffer	2 m / 6.6 ft
Vertical Flight Geography Buffer	2 m / 6.6 ft
Horizontal Contingency Volume Buffer	2 m / 6.6 ft
Vertical Contingency Volume Buffer	2 m / 6.6 ft

Table 7-1 - Volume Buffers

The overall flight geography boundary is wrapped tightly around the planning volume. To allow for small flight technical errors (FTE) or meteorological conditions (e.g. wind), the flight geography extends past the planning volume by 2 meters / 6.6 feet in the horizontal and the vertical direction. The Bee will enter a contingency procedure when it detects that it breached the flight geography boundary. The contingency procedure that is entered when the Bee breaches the flight geography volume boundary is an emergency return-to-land (E-RTL). During an E-RTL the Bee will climb to the ceiling of the flight planning volume, a space that is free of obstacles, and return in a straight line back to the Hive where it performs a precision approach to land.

The contingency volume extends around the flight geography by 2 meters / 6.6 feet in the horizontal and vertical. At the edge of the contingency volume, the Bee will perform an emergency landing procedure descending at its current location with a moderate vertical rate and landing on the ground outside of the Hive.

Therefore, the contingency volume is bound in width by the property perimeter (or flight planning perimeter) plus 4 meters / 13.1 feet and in height by the tallest obstacle on the property plus 10 meters / 32.8 feet.

Parameter	Value
Contingency Volume Height	tallest obstacle + 10 m / 32.8 ft
Contingency Volume Boundary	property boundary + 4 m / 13.1 ft

Table 7-2 - Contingency Volume definition

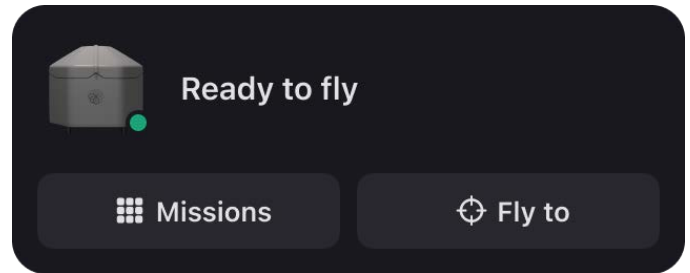
The emergency return to land cruising altitude is at the ceiling of the planning volume.

Parameter	Value
E-RTL Cruising Height	tallest obstacle + 6 m / 19.7 ft

Table 7-3 - Emergency Return to Land Height (AGL)

7.3. Types of Operations

The system operates with a straightforward concept. Pre-defined virtual camera points, referred to as **Locations**, and pre-programmed **Routes**, can be configured anywhere within the designated planning area. When needed, the pilot can easily select to **Inspect** a specific **Location** or initiate a **Patrol** of a **Route** from the **Missions**.



Another way to fly the Bee is to double-click a location in the 2D or 3D map or in the video. This type of operation is called “fly to” and can be activated by clicking the **Fly to** button next to the **Missions** button. While the fly to function is active, the **Fly to** button is highlighted. The fly to function can be deactivated by clicking this button again.



Figure 7-3 - Control Station (CS) application in split view

The pilot always has access to the emergency controls, including **Land in Hive**, **High-altitude return**, **Land in place**, and **Stop motors**. The emergency controls can be accessed in the bottom-left corner of the CS. See [Emergency Controls](#) for details.



The regular **Land** button, which is the same as the **Land in Hive** button under the emergency controls, is only shown during flight. See [Landing and Pause Controls](#) for further details.



While in flight, the Missions and Fly to buttons move from the top-left of the CS (see above) to the bottom-left of the CS next to the Land button. While in flight, the Pause button will also be shown.

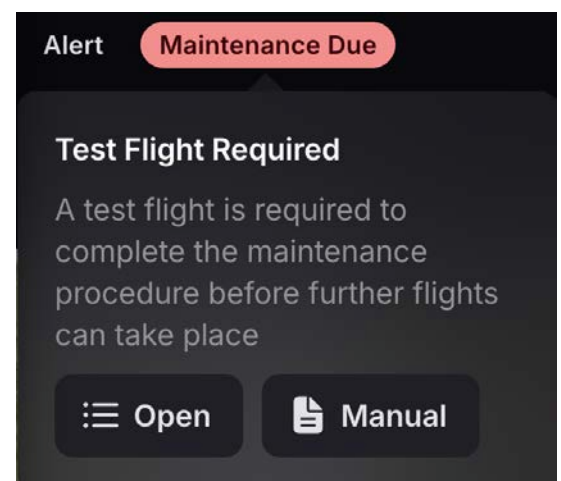


While the Bee is in flight, the pilot also has access to controls in order to rotate the Bee, to command the Bee to get closer or farther from an object, or to increase or decrease altitude. These commands are accomplished in discrete steps and limited to the flight planning volume and obstacles. See [Camera Controls](#) for further details.

Weather and flight advisories in the area are monitored and the UAS warns the pilot if weather conditions are outside of the system operational limitations and/or there are active flight advisories prohibiting flight. See [Advisory Status](#) for further details.

The CS provides the necessary situational awareness when the Bee is in flight and when the Bee is landed. The CS constantly provides system failure, mission execution failure and flight mode information and shows the real-time Bee position on the map (in 2D and/or 3D) and streams the live video from the Bee while the Bee is in flight.

In case a test flight is required the Mission dialog will show a **Test flight** button.

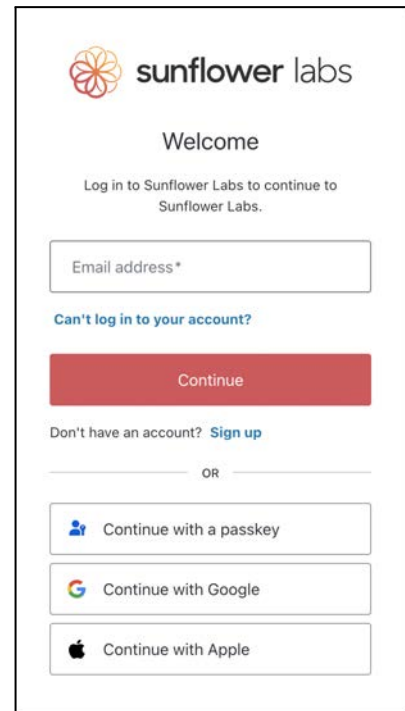
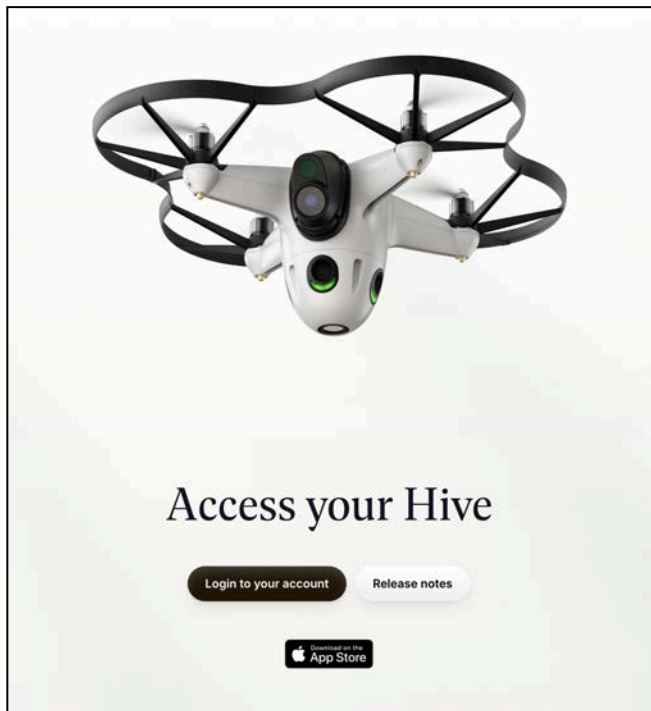


7.4. Getting Started

In a web browser go to the following URL:

<https://app.sunflower-labs.com/>

Click on **Login to your account** and provide your credentials.



Once logged in, you will be either directly redirected to your Hive if you only have access to one system, or you will be redirected to the Hive selector panel that shows all the Hives that you have access to.

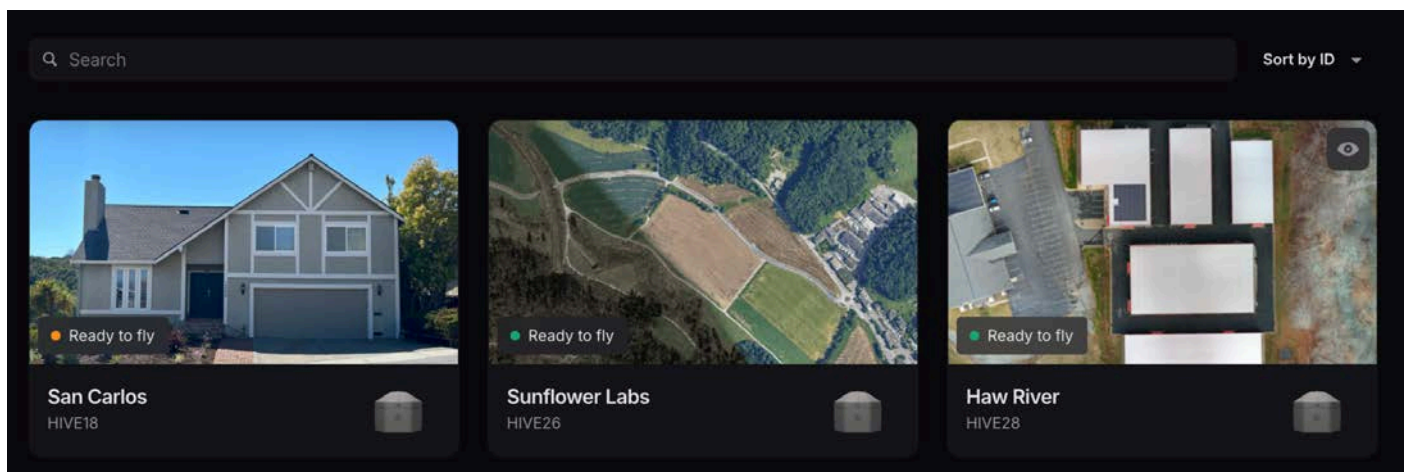
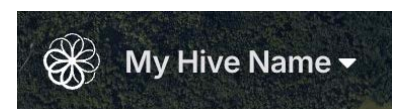


Figure 7-4 - Hive Selector Panel

If the selector panel is presented, select the Hive you want to connect to.



Once the CS is connected to a Hive, the main CS window will load and open. The top left shows the current Hive connection. Ensure that you are connected to the correct Hive.

If you have access to multiple systems, there will be a dropdown next to the Hive name that will let you easily connect to a different Hive.

7.5. System Information Bar

The top of the CS shows a permanently visible System Information Bar floating above the map element.



Figure 7-5 - System Status Bar

If you lose connection to the cloud or the Hive loses connection to the cloud, a red bar will appear above the system status bar indicating this loss of connection.

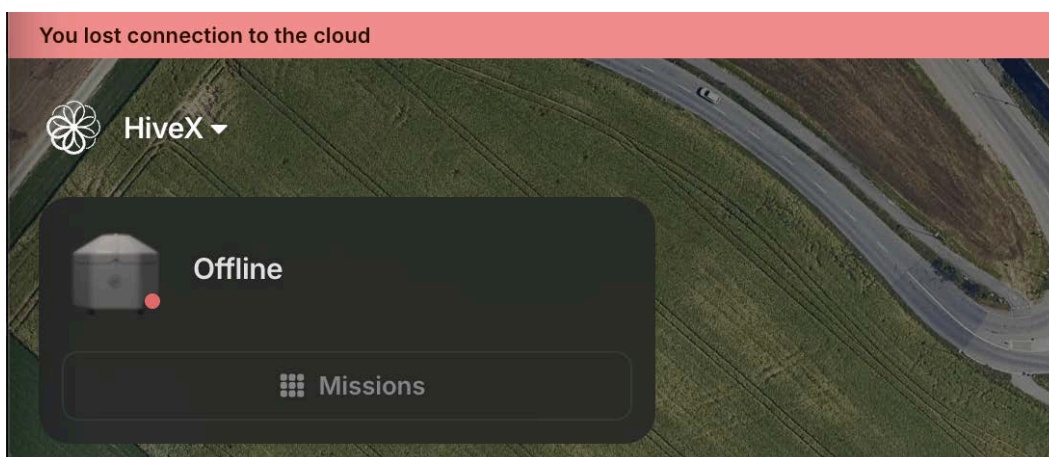


Figure 7-6 - Lost Cloud Connection

7.5.1. UAS Identifier and Selector

The UAS identifier indication on the very left of the system information bar shows the name of the UAS that the CS is currently connected to.

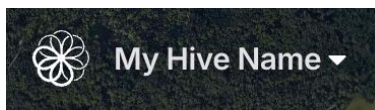


Figure 7-7 - UAS Identifier Indication

This UAS Identifier also provides a dropdown that lets the pilot quickly access any UAS that the pilot has access to.

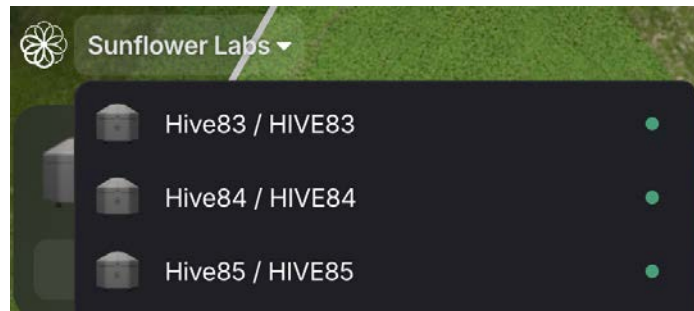


Figure 7-8 - Hive Selector Dropdown

Clicking on the Sunflower Labs logo to the left of the UAS Identifier will present the Hive selector panel. From this panel the pilot can also connect to a different Hive. The back button in the browser can be clicked to get back to the previous Hive connection.

7.5.2. Hive Menu Button

The very right of the system information bar contains the **Hive Menu** button. From this dropdown button the different pages of the CS can be accessed.

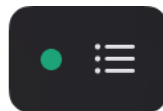


Figure 7-9 - Hive Menu Button with Status Indication

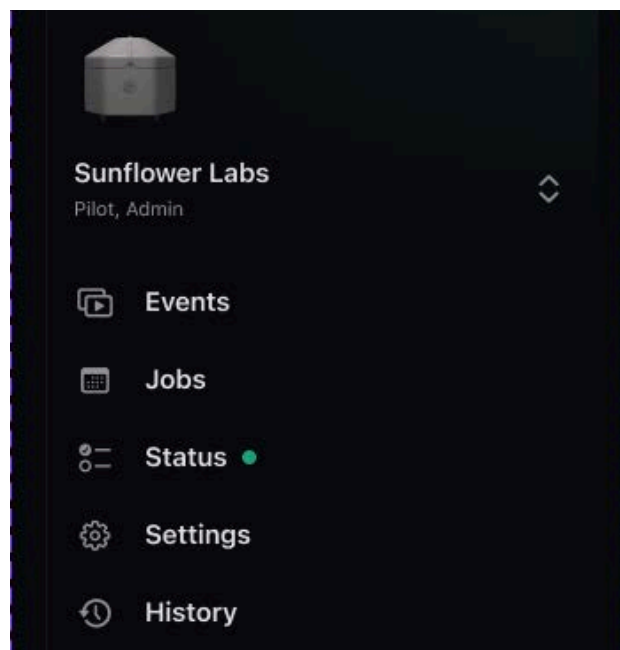


Figure 7-10 - Hive Menu

The top of the menu shows the Hive that the CS is connected to. The dropdown to the right allows the pilot to quickly switch between Hives.

Below the name of the Hive, the roles of the connected user are shown. The user roles define the access level of the user.

The roles are as follows:

Viewer	A viewer can only view the CS and monitor flights, but cannot fly the Bee or administer the UAS.
Pilot	A pilot can fly the Bee but cannot administer the UAS.
Admin	An admin user can administer the UAS but cannot fly the Bee.

Table 7-4 - User Roles

At the bottom of the menu is the name and the email of the currently signed in user.

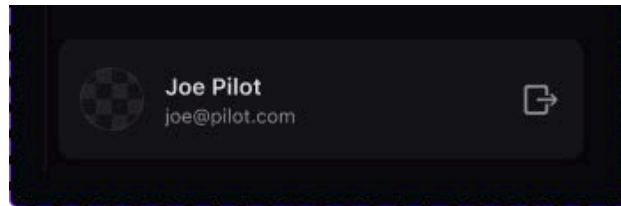


Figure 7-11 - User Info

Click on the **log out** button to the right to log out.



The traffic light to the left of the **Hive Menu** button indicates the overall health of the UAS. The traffic light may indicate Good (green), Marginal (amber), or Bad (red).

	Good	The system is healthy and ready. When this indicator is green all systems are Go and the Bee may be deployed.
	Marginal	Some system health parameters are marginal. The Bee may be deployed but the pilot must acknowledge the caution and proceed with such.
	Bad	Some system components' health or status parameters are out of limit (component is in a failure state) or the weather or flight conditions are prohibiting flight. The Bee may not be deployed.

Table 7-5 - Ready, Caution and Warning Indication

The mission dialog also contains the same system status indicator while the Bee is not in flight.

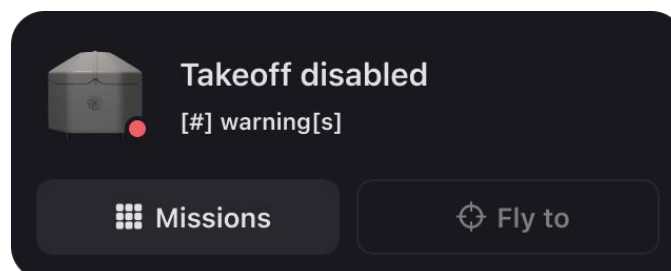


Figure 7-12 - Mission Dialog

If any caution or warning is present, clicking on the **Hive Menu** button and then selecting **Status** will reveal the component that is exhibiting the caution or the warning. Selecting the component will reveal the details and the reason for the caution or the warning in the component.

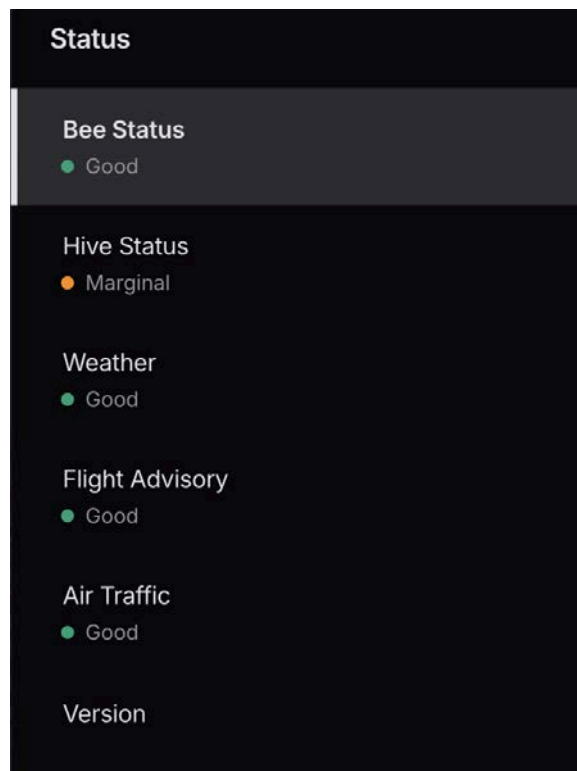
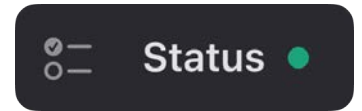


Figure 7-13 - Hive Menu

7.5.3. Bee Status Indications

To the left of the **Hive Menu** button in the system information bar are the **Bee status** indications for the battery, the radio link, and the GPS.



Figure 7-14 - Bee Status Indications

7.5.3.1. Battery Status Indication

The left-most Bee status indicator shows the current status of the Bee battery.

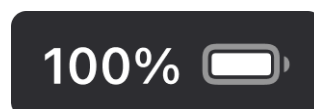


Figure 7-15 - Battery Indication

The charge of the Bee battery is shown as a percentage. The battery icon indicates whether the battery is charging, discharging, or is in an error state. The icons have the following meaning:

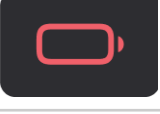
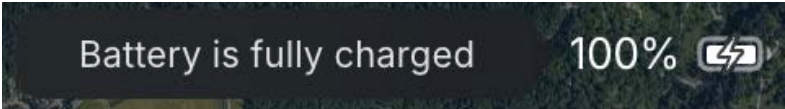
	The battery is charging .
	The battery is fully charged and not charging.
	The battery is 50% charged and not charging.
	The battery is low . The Bee will return to land shortly.
	The battery is depleted . The Bee will land in place shortly.
	The battery has reached a critically hot temperature. If in flight, the Bee will return to the Hive and reject any further flights. A battery temperature alert will be displayed. If the Bee is in the Hive, charging will be suspended until the battery cools down. or The charging circuit is too hot and charging will be suspended. Charging will resume once the charging circuitry cools down.
	Temperature-limited charging . The battery is too hot or too cold to fully charge.
	The battery has reached a critically cold temperature. If in flight, the Bee will return to the Hive and reject any further flights. A battery temperature alert will be displayed. If the Bee is in the Hive, charging will be suspended. or The charging circuit is too cold and charging will be suspended. Charging will resume once the charging circuitry warms up.
	The battery is in an error state. If in flight, the Bee will land in place.
	No battery information is available. If in flight, the Bee will return to land.
	The battery is missing .

Table 7-6 - Battery Charge Status Indication

Hovering over the battery will show the current battery status.



Clicking on the battery percentage will reveal the *remaining flight time* (including the safety margin).



7.5.3.2. C3-Link Indication

The middle Bee status indicator shows the current C3-link (Command, Control and Communication) status.



Figure 7-16 - C3-Link Quality Indication

The radio status icon shows the received signal strength of the C3 link. The icons have the following meaning:

	The radio signal strength is excellent, very good, or good (from 5 to 3 bars)
	The radio signal strength is marginal . It is possible that communication problems with the Bee will be experienced.
	The radio signal strength is poor . It is likely that communication problems with the Bee will be experienced.
	The Bee is not connected
	No radio status information is available

Table 7-7 - C3 Link Quality Indication

7.5.3.3. GPS Signal Level Indication

The right-most Bee status indicator shows the current status of the GPS of the Bee.



Figure 7-17 - GPS Quality Indication

The GPS status icon indicates the health of the GPS position solution of the Bee. The icons have the following meaning:

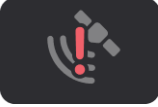
	GPS position fix quality is good
	GPS position fix quality is marginal . The Bee will perform an emergency return to the Hive if the position estimation allows it.
	GPS position fix quality is poor or invalid . The Bee will likely land in place.
	GPS receiver failure . The Bee will land in place.
	No GPS status information is available

Table 7-8 - GPS Quality Indication

7.5.4. Bee Flight Mode and Status Annunciation

Before the flight, the Bee flight status indication is shown in the top-left of the CS above the mission selector.

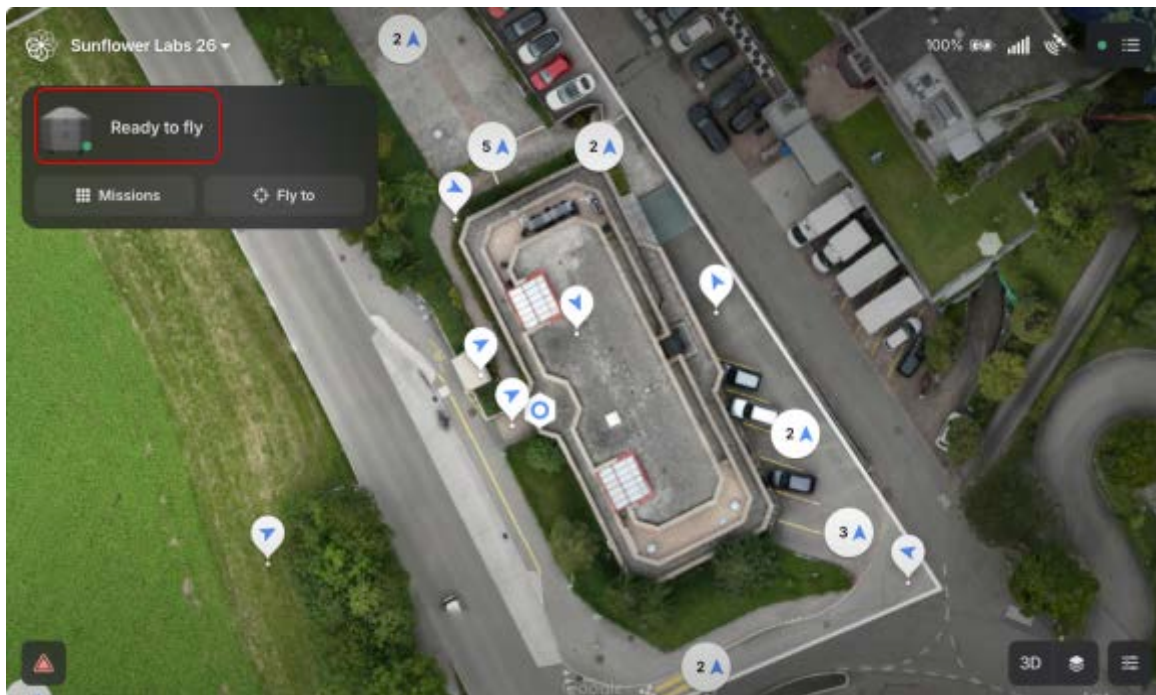


Figure 7-18 - Flight Status Indication

During flight, the Bee flight mode indication is displayed in the lower left corner of the CS above the emergency button. Below the flight mode indication, in this case **On inspection**, the name of the current mission is displayed.

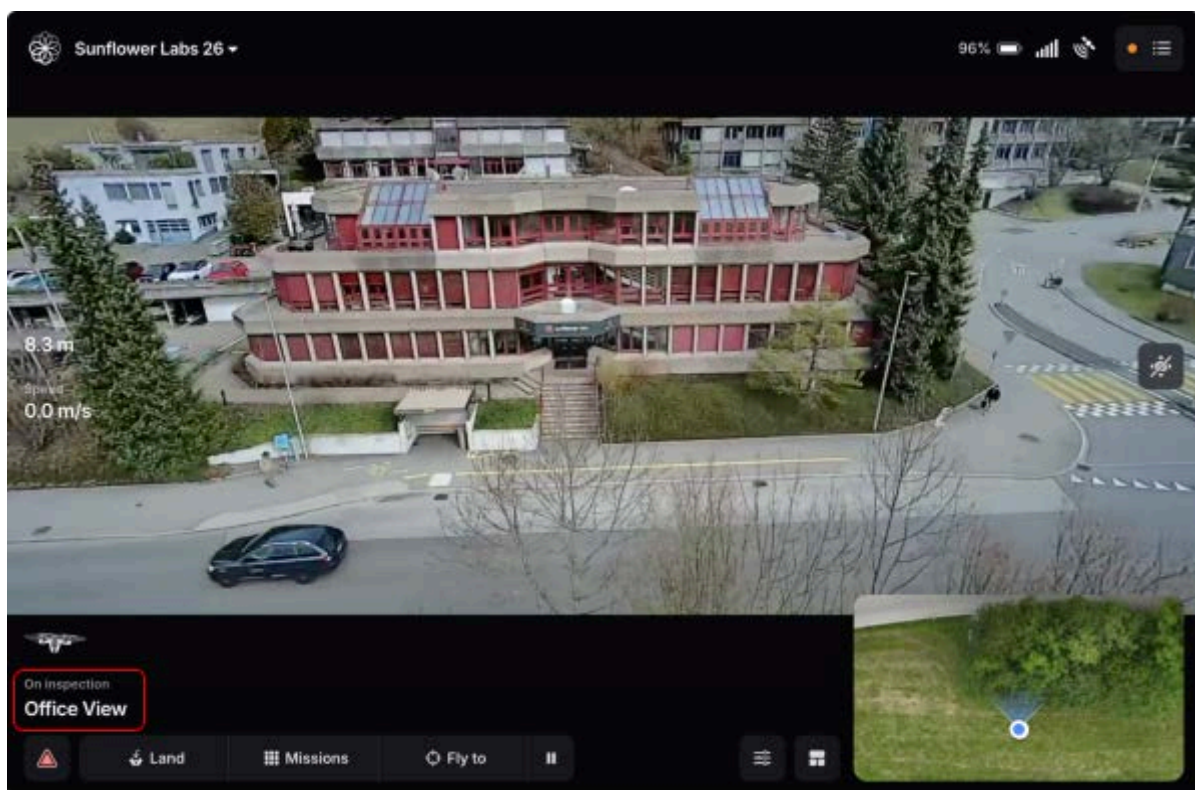


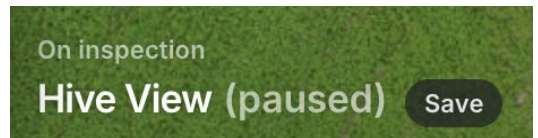
Figure 7-19 - Flight Mode Indication

The possible flight modes are:

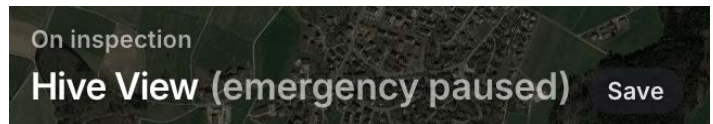
Indication	Flight Mode
Ready to fly	The Bee is in the Hive.
Taking off	The Bee is in the process of taking off.
On inspection	The Bee is airborne and flying an inspection mission.
On patrol	The Bee is airborne and flying a patrol mission.
Returning	The Bee is returning to the Hive to land.
Landing	The Bee is landing in the Hive.
Repositioning	The Bee is repositioning after getting control inputs from the camera control panel (see Camera Controls)
On test flight	The Bee is performing a test flight.
Paused	The Bee's mission has been paused, with its current status displayed, and the Bee is hovering in place.
Emergency paused	The Bee is paused during an automated abnormal procedure and is currently hovering in place, waiting for the pilot's decision on the next course of action.
Returning fallback	The Bee is performing an emergency return to the Hive where it will land in the Hive.
Landing fallback	The Bee is performing an emergency landing at its current location and will not land in the Hive.
Killed	The Bee's motors have been shut down.
Error	The Bee is in an error state or the system is unable to determine the Bee's state.
Landed outside	The Bee is landed outside of the Hive. The Bee will automatically turn off after downloading the flight logs.
Unknown	The Bee's flight mode is unknown. This is most likely due to a loss of communication with the Bee.
Not configured	Either the Hive location, the maximum flight altitude, or the geocage are not configured or the map is invalid.

Table 7-9 - Flight mode and status indication

Note: When the Bee is paused, the flight mode indication will still show what the Bee was doing when it was paused, which is also what it will continue doing when it is unpaused. The **paused** indication will be shown to the right of the name of the destination (in this example Hive View). The **Pause** button is also replaced by a **Play** button.



Note: When the Bee is emergency paused, the indication is similar to the one when the Bee is paused but it will say **emergency paused**.



Warning:

When the system is in the emergency paused state, it will not react automatically to emergency situations anymore. Remain in the emergency paused state only under severe circumstances.

7.6. Flight Data and Planning Indication

The system is capable of displaying certain flight data, such as height (above takeoff), ground speed, attitude, and flight planning (route) information on the CS screen.

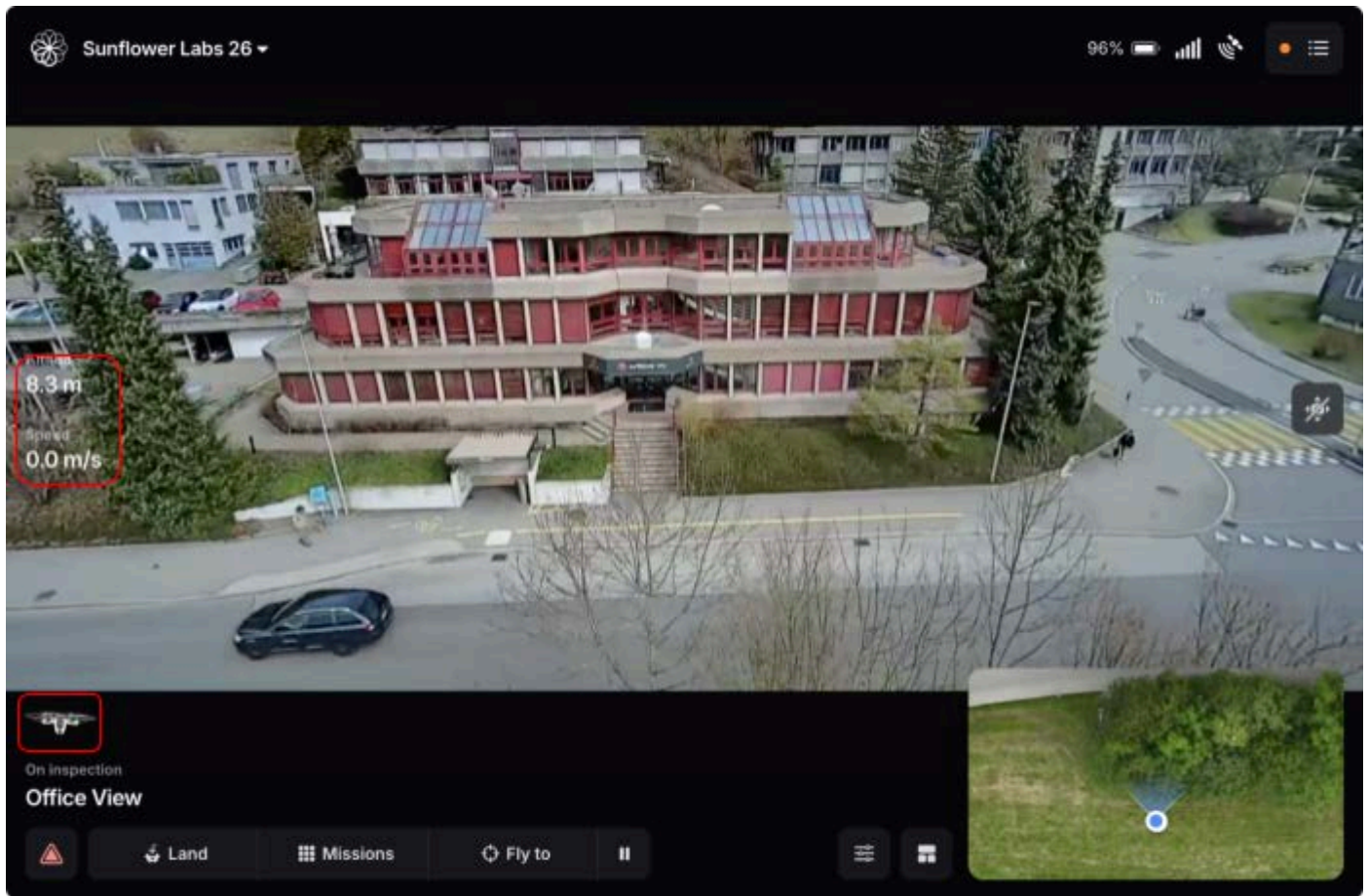


Figure 7-20 - Altitude, ground speed and attitude indication

7.6.1. Flight Planning Information

Once the system has completed flight planning, the planned flight path will be shown in the map (2D and 3D).

On the 2D map, a gray flight path segment indicates the recently completed leg, whereas on the 3D map, the active leg is shown as a red flight path segment.

During flight, the Bee's current location is displayed on the map.

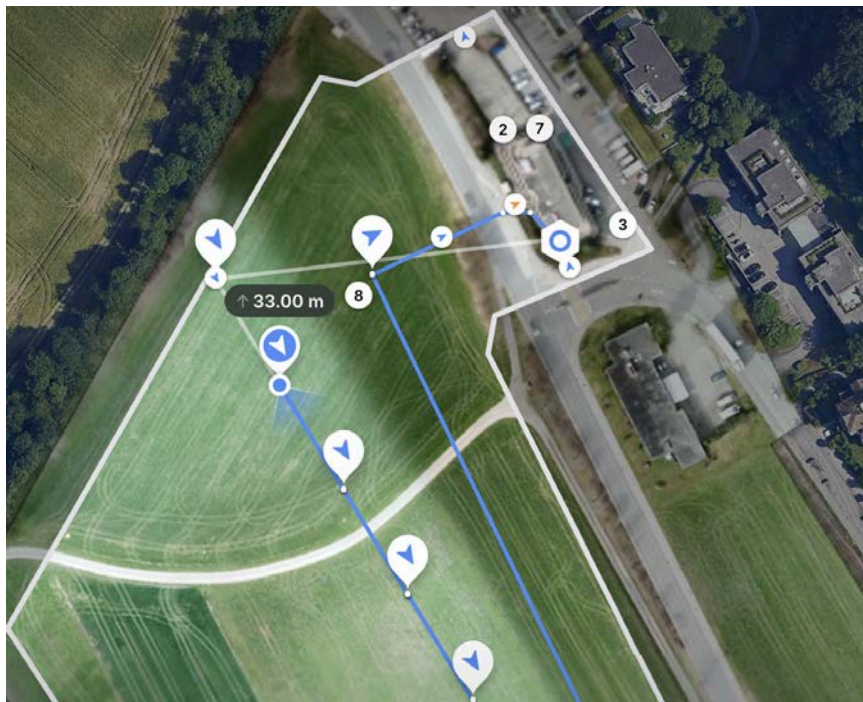


Figure 7-21 - Active flight (2D map)

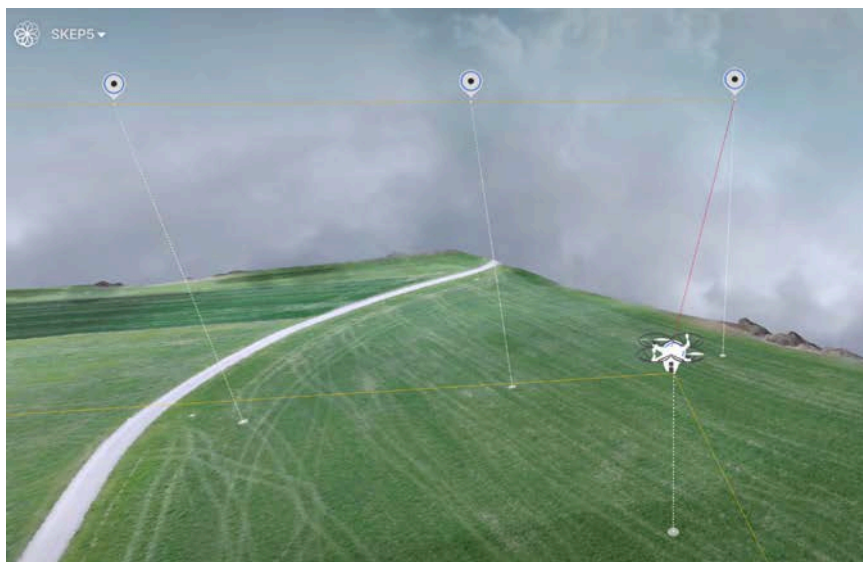


Figure 7-22 - Active flight (3D map)

7.6.2. Altitude Indication

While the UAS is in flight, the CS shows the altitude and the ground speed in the center left of the display. The altitude is given as the height above or below the takeoff location, i.e., the Hive.

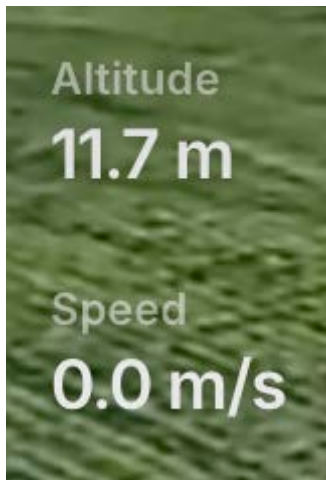


Figure 7-23 - Altitude and ground speed indication

7.6.3. Attitude Indicator

The CS contains an attitude indicator above the flight mode indicator while the Bee is in flight. This attitude indicator is shown as a representation of the Bee indicating current pitch and roll of the airframe.

The attitude indicator shows the Bee orientation relative to Earth's horizon. Since Bee operations are completely automatic, the pilot does not need to determine the exact pitch and roll. However, the indicator provides a general sense of the airframe's stability during flight.

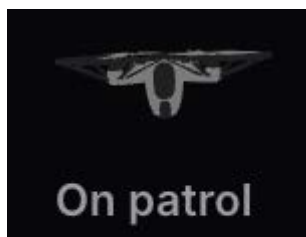


Figure 7-24 - Attitude Indicator

7.6.4. Collision Detection

The collision detection indicator is positioned in the center of the top system information bar within the CS and uses data from the Bee's anti-collision system. When a nearby obstacle is detected, it activates to provide a visual alert to the remote pilot.



Figure 7-25 - Collision Detection Indicator

The collision detection indicator shows the detection distance of obstacles that are detected by the four range sensors on the Bee. In the indicator, the Bee is shown with the front (camera payload) towards the top of the CS.



Figure 7-26 - Collision Detection Rings

The colors of the rings are as follows:

Color	Obstruction Distance
Yellow	< 6 meters
Orange	< 1 meter
Red	< 0.3 meter

Table 7-10: Collision Detection Colors

7.6.5. Landing Beacon Detection

During the precision landing approach into the Hive, the Bee tracks the precision landing system signal from the Hive. The centering accuracy is shown during landing in the center of the top system information bar.



Figure 7-27 - Landing Beacon Detection Indicator

The landing beacon detection indicator is shown during the precision landing approach. The indicator is red when the Bee is more than 2 meters off center and it is green otherwise. The relative position of the Bee symbol to the indicator and the relative size of the Bee symbol indicates the relative position of the Bee to the actual Hive and the height above the Hive, respectively.



Figure 7-28 - Off Center



Figure 7-29 - Centered above the Beacon

7.7. Maps and Views

7.7.1. 2D Map

The 2D map is the default map that is loaded when the CS first loads. If the 3D map is showing the map can be changed back to 2D if the **2D** button in the lower-right corner is clicked or by pressing the '2' key on the keyboard.

2D

The 2D map shows a top-down view of the property with the geocage (white border) and all the predefined locations (markers).

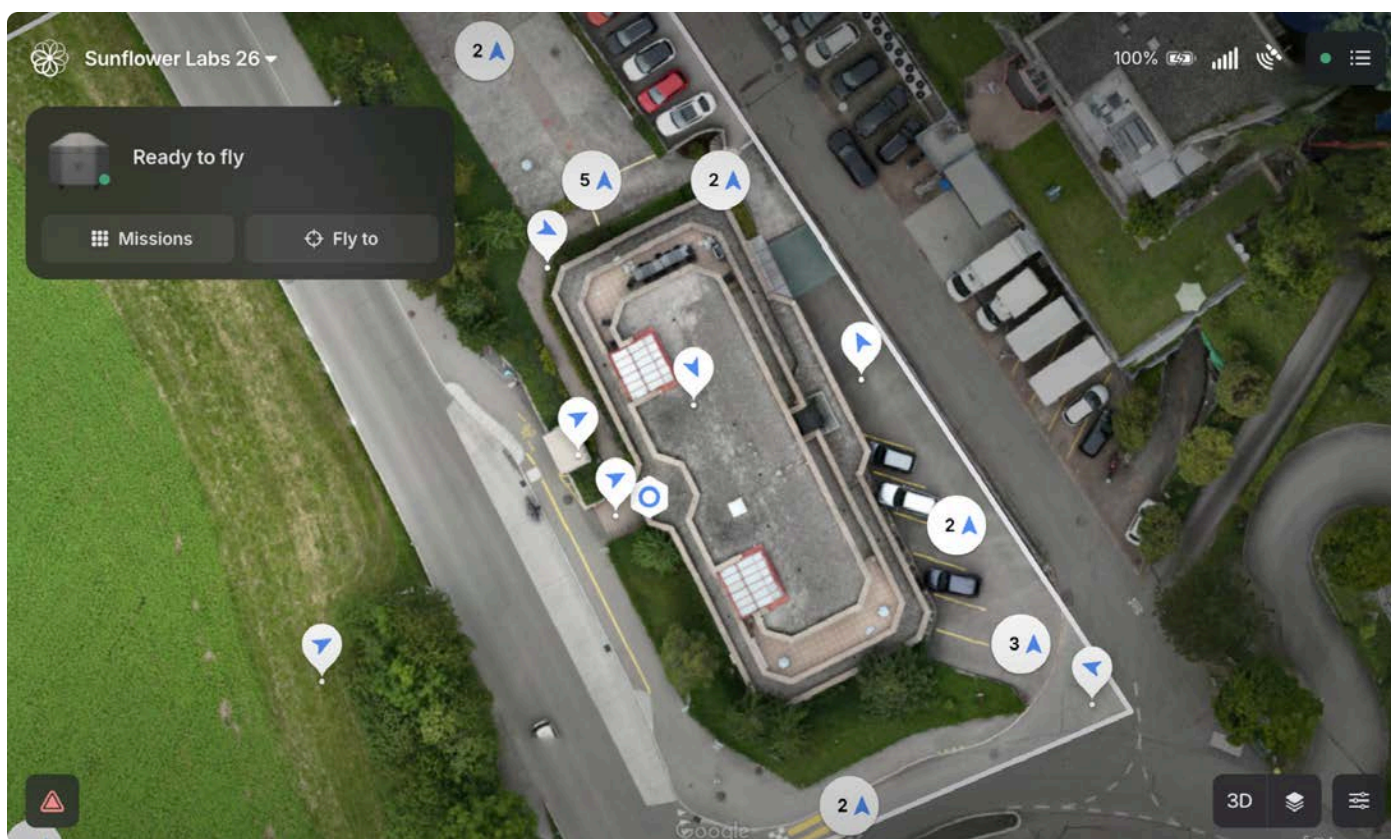


Figure 7-30 - 2D Map

7.7.2. 3D Map

If the 2D map is showing, the map can be changed back to 3D if the **3D** button in the lower-right corner is clicked or by pressing the '3' key on the keyboard.

3D

The 3D map shows a 3D reconstruction of the property and all the predefined locations (markers).



Figure 7-31 - 3D Map

7.7.3. Map Menu and Shortcuts

The 2D and 3D map contain a map options menu. Click on the map options button to see and select the options.



Figure 7-32 - Map Options Button

7.7.3.1. 2D Map Menu and Shortcuts

Option	Shortcut	Description
Recenter to Bee	B	Re-centers the map on the Bee
Save Current View	V	Save the current view as the default 2D map view (Only available to administrator)
Roadmap	M	Cycles through the available map types: • Road Map • TerrainMap • Satellite Map • Satellite Map with annotations
Orthomosaic	Shift + M	Shows/hides the high-resolution orthomosaic map of the property (if available)

Table 7-11 - 2D View Menu**7.7.3.2. 3D Map Menu and Shortcuts**

Option	Shortcut	Description
Recenter to Bee	B	Centers the 3D map view around the Bee, and follows the Bee in flight, looking into the direction of flight. (3rd-person view)
Save Current View	V	Save the current view as the default 3D map view (Only available to administrator)
Save View as Thumbnail		Save the current view as the hive thumbnail (Only available to administrator)
Show/Hide Geocage	G	Shows/hides the geocage around the property
Show/Hide Obstacles	O	Shows/hides the obstacle map
Show/Hide Expanded	X	Shows/hides the expanded obstacles map

Table 7-12 - 3D View Menu

7.7.4. Split View

When the Bee is in flight, the split view will be shown by default. In this view, the video from the Bee is shown on top, the 2D map is shown in the bottom-left, and the 3D map is shown in the bottom-right of the window.

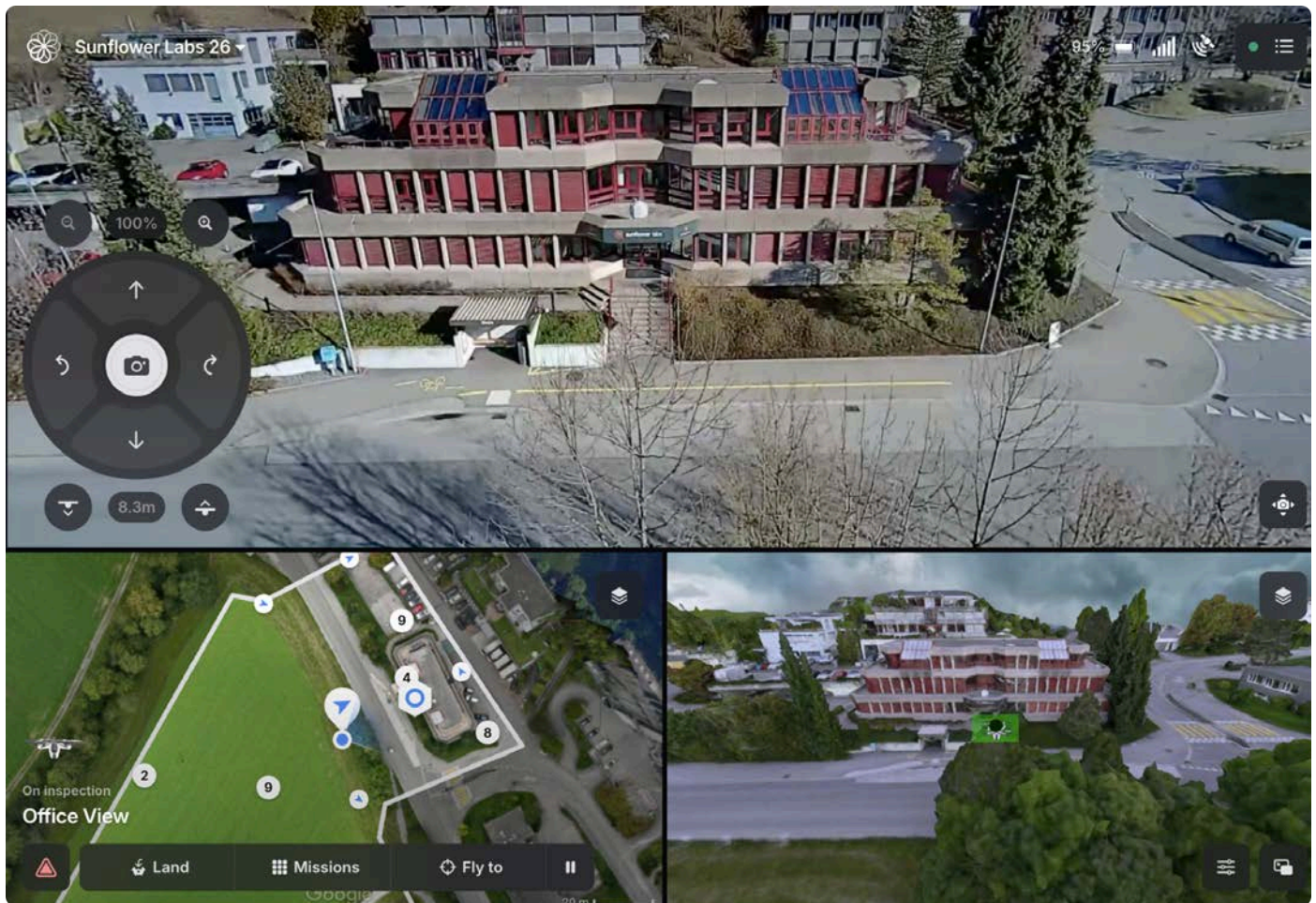


Figure 7-33 - Split View

7.7.5. PiP

When the Bee is in flight the picture-in-picture (PiP) view can be loaded from the split view by clicking on the PiP button in the lower-left corner of the split view.



From the PiP view you can return to the split view by clicking the split view button in the bottom-right corner of the PiP view.



In the PiP view, the map (2D or 3D) will be shown fullscreen with the video window being shown picture-in-picture in the lower-right corner of the CS.

By clicking on the PiP window in the lower-right corner (in the case below the video window) the view can be swapped. The video will then be shown fullscreen and the map will be shown as PiP. When the map window is the PiP window, the 2D map (and not the 3D map) will be shown.

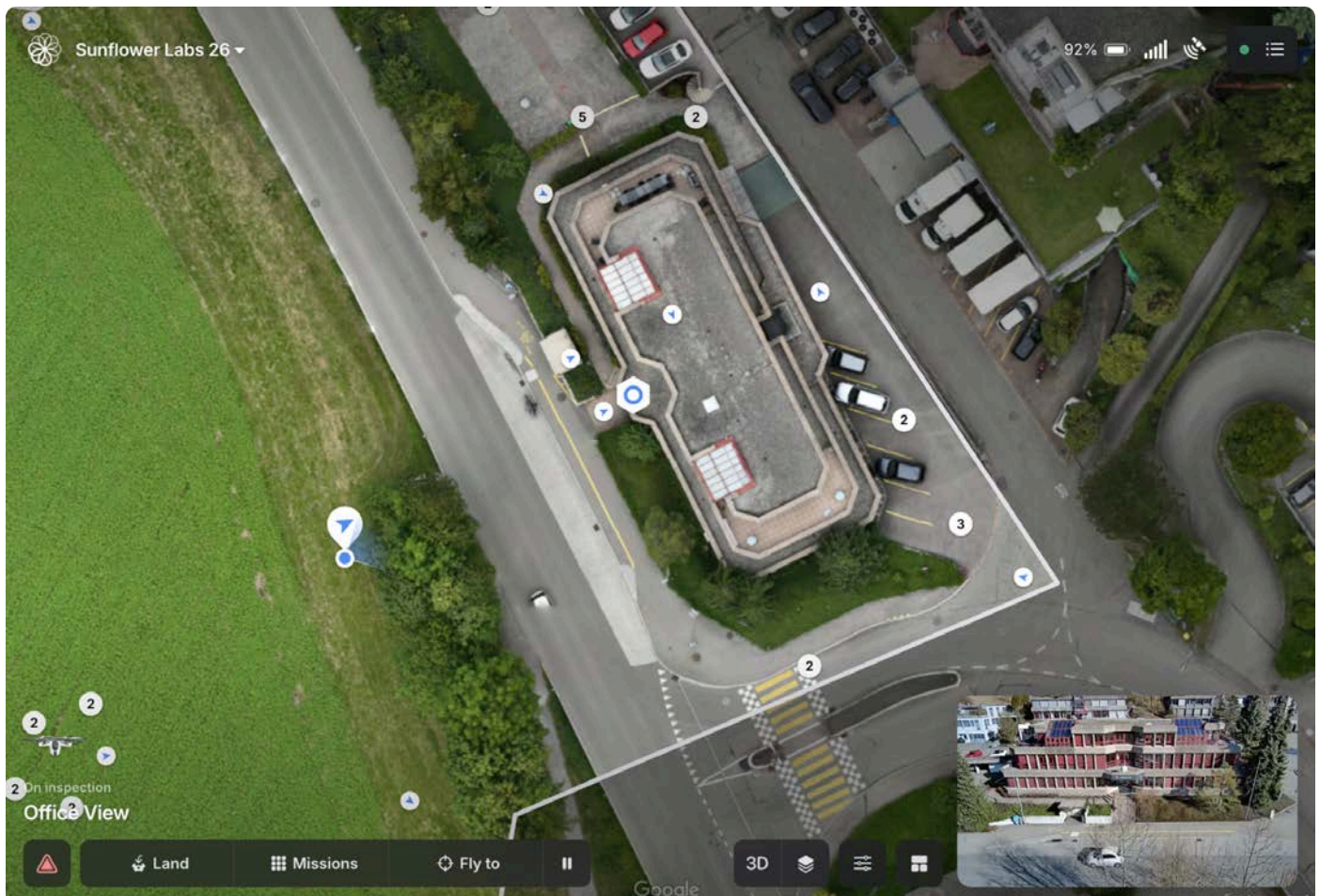


Figure 7-34 - PiP view with the 2D map in the main window and the video PiP

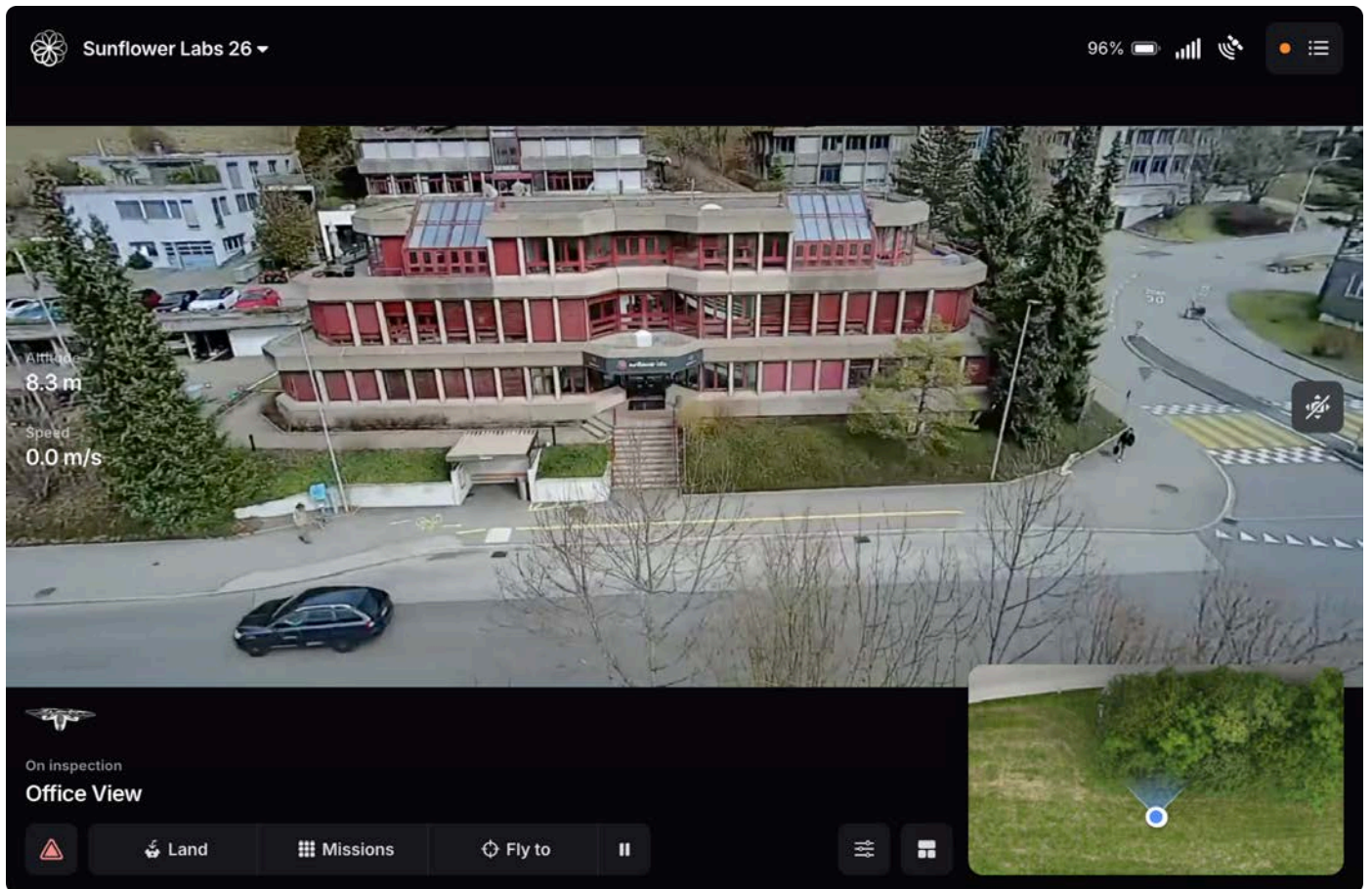


Figure 7-35 - PiP view with the video in the main window and the 2D map PiP

7.8. System Failure Detection and Indication

The UAS utilizes a sophisticated Built-In-Test (BIT) feature in order to continuously monitor the system health status and derive a “Go - No Go” decision before each take-off and during flight.

Under a “No Go” condition the **Start Patrol** and **Inspect Location** under the Mission button and the **Fly to** buttons are grayed out and not selectable. If your system is experiencing any of these failures, follow the [troubleshooting guide](#).

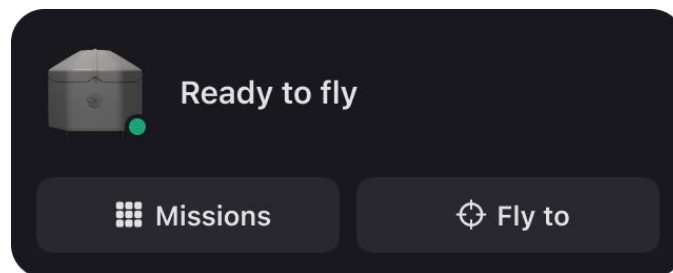


Figure 7-36 - Ready to fly

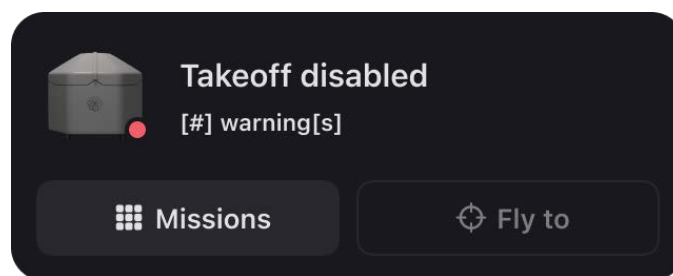


Figure 7-37 - Takeoff disabled

7.8.1. Alerts

The CS contains an alert bar at the top in case any system failure, pre-flight test failure, weather, flight advisory, or traffic advisory is present.

Hovering over the alert will show details about each failure in a tooltip. The tooltips link to the relevant status or settings page within the CS as well as the relevant sections of the manuals.

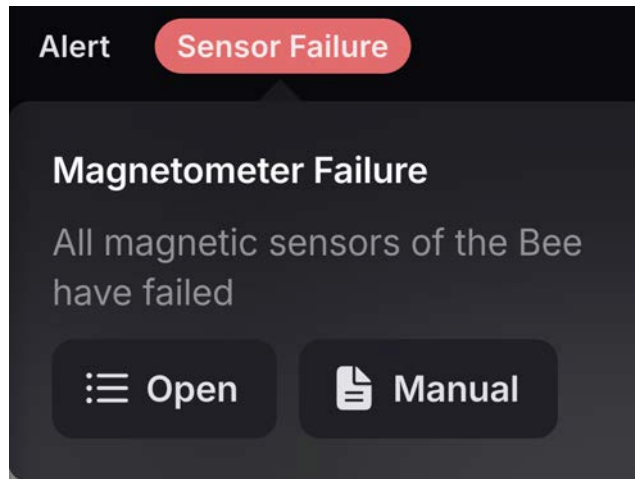


Figure 7-38 - Alert with tooltip

When no alerts are active, the alert bar is not visible.

The color of the alert indicates the severity of the alert.

- Informational: Cyan alerts do not affect the Bee's ability to fly. No pilot action is required.
- Caution: Amber alerts indicate a potential problem. The pilot may be required to override the alert.
- Warning: Red alerts indicate an immediate problem that may require pilot action. If such a problem occurs in flight, the Bee will return to the Hive. Takeoff is disabled.
- Emergency: Dark, pulsing red alerts indicate that pilot action is required. If such a problem occurs in flight, the Bee will land at its current position. Takeoff is disabled.

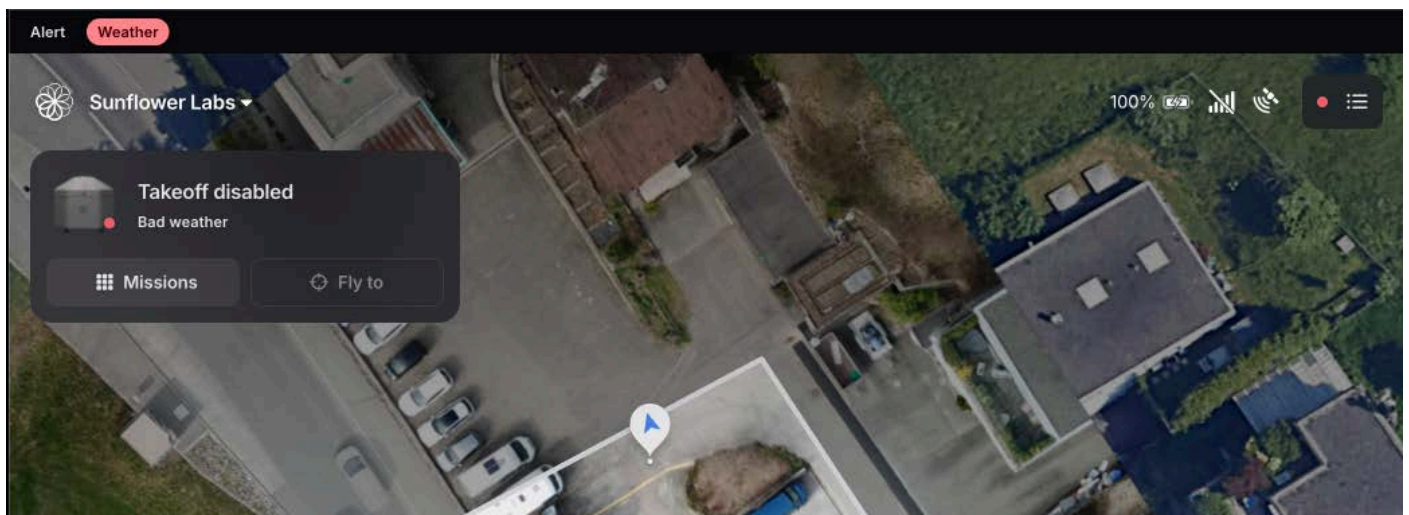


Figure 7-39 - System Alert Bar

Note: The DAA alerts do not follow the coloring scheme described above. Refer to section [DAA Maneuvers](#) for more information.

7.8.2. Notifications

System notifications are shown as popup windows in the top-right corner of the CS.



Figure 7-40 - Notification popup

A notification might be telling the pilot that a command wasn't successful, that the system is shutting down shortly, or that the Hive roof was left open too long.

Notifications come in three different colors indicating their priorities: red (high priority), amber (medium priority), and white (low priority).

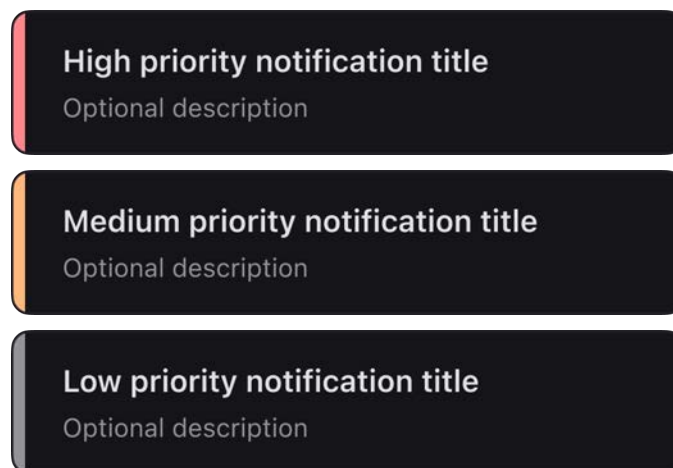


Figure 7-41 - Notification Priorities

7.8.3. Mission Execution Failure

Bee mission execution failures are shown as notifications to the pilot. Mission execution failures are posted when the UAS rejects any commanded pilot input. It may be that certain commands are disabled or that certain missions or flight maneuvers cannot be executed safely at the moment. Refer to [Troubleshooting](#) for a complete list of possible mission execution failures.

7.8.4. System Status

The system status is indicated in the CS and on the control panel of the Hive itself.

7.8.4.1. System Status Indication on Control Station

If a system caution or warning is present, the system status will reflect it by showing an appropriately colored dot next to the hive and an explanatory status text.

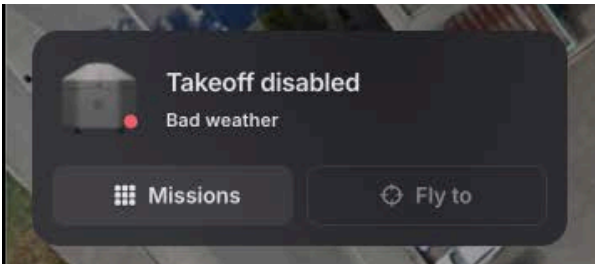


Figure 7-42 - System Status Indication

System Status		Description
	Good	There are no active cautions or warnings and no unacknowledged advisories.
	Caution	There is at least one active caution. Proceed with caution.
	Warning	There is at least one active warning. Takeoff is disabled.

Table 7-13 Advisories Status

Note: If the light on the overall system status is not green, the system status page provides additional information about the reason why the flight is prohibited.

If a failure is present the **Hive Status** in the **Hive Menu** will provide additional details.

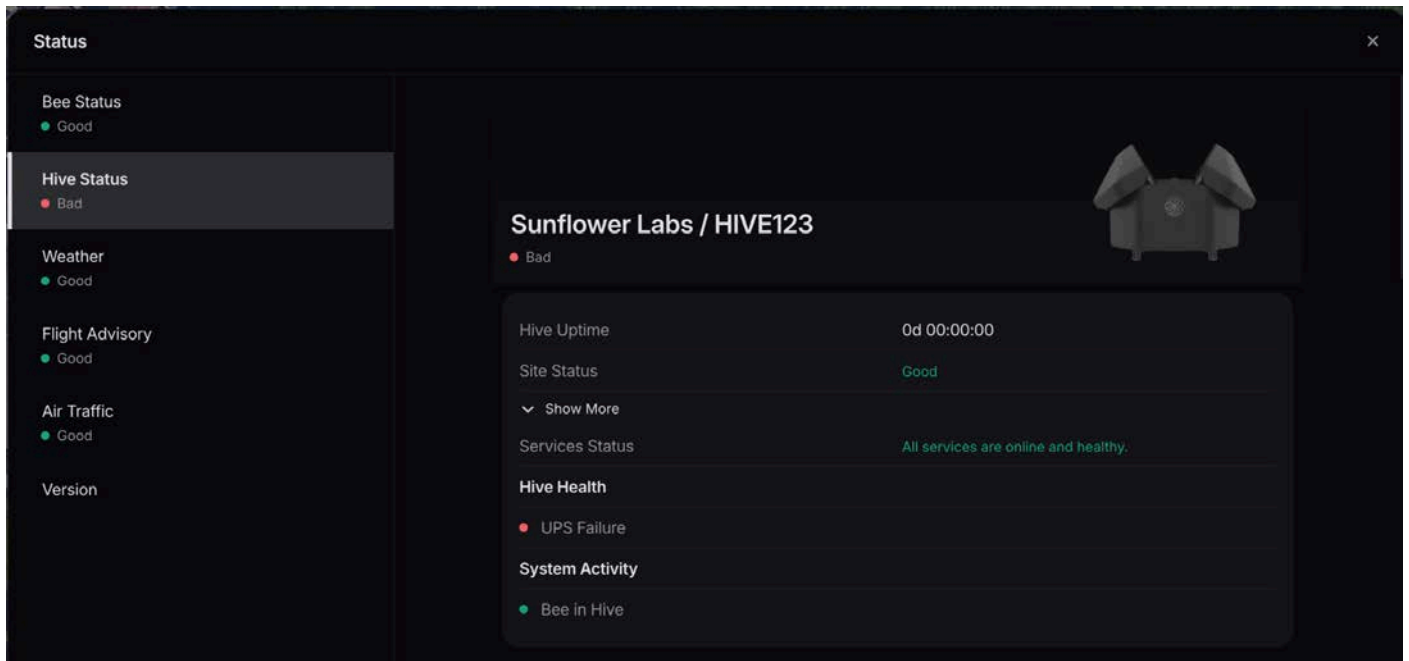


Figure 7-43 - Hive Status

7.8.4.2. Hive Status Indication on Control Panel

One of the carrying handles on the Hive contains the Hive control panel. The Hive control panel contains three status LEDs and three buttons.



Figure 7-44 - Hive Control Panel

	LED (blue):	Off	No power detected
		Blinking	The system is powered by the UPS
		Solid	The system is powered by Mains power
	LED (yellow):	Off	The Hive software is not running
		Blinking	The Hive software is starting
		Solid	The Hive software is operational
	LED (green):	Off	The system is not running
		Blinking	Not connected to the cloud service
		Solid	Connected to the cloud service

Table 7-14 Control Panel LEDs



Press and hold for 3 seconds to make the Bee return to the Hive
(same as **Land** button in the CS)



Press and hold for 3 seconds to make the Bee land in place
(same as **Land in place** button in the CS)



If the roof is closed: **Press to open**
If the roof is open: **Press to close**
If the roof is moving or stuck: **Press to pause the roof motion**
If the roof motion was paused: **Press to resume**

Table 7-15 Control Panel Buttons

7.9. Advisory Status

The system provides flight and weather advisories. The flight advisories present any active NOTAMs, like TFRs, that are active in the area where the system is installed. The weather advisory function monitors the weather in the area and alerts the pilot if any of the weather parameters are outside of the system limitations.

The alert bar will indicate if there are active flight or weather advisories.

7.9.1. Weather Status

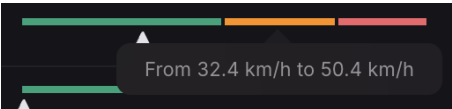
In the Status page the CS provides a detailed weather report for the installation location of the Hive, including the current weather and a weather forecast. The weather forecast considers the weather predictions for the upcoming 30 minutes.



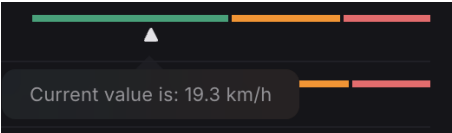
Figure 7-45 - Weather Status

The weather status page provides a visual overview of the parameters relevant to weather-based GO/NO-GO decisions. Each parameter includes an interval indicating the range of values classified as good (green), marginal (amber), or bad (red), where applicable.

Hovering over an interval displays the specific limits of the interval to the user.



Hovering on the triangular indicator gives the exact value of the current weather parameter.



A solid triangle shows the current weather measurement. A forecast is represented by an outlined triangle with a dashed line connecting it to the current measurement. If the forecast is very close to the current measurement, only the worst one is shown.

When a forecast value is worse than the current value, the predicted value is displayed as a number, with **(Forecast)** appended to the label for clarity.

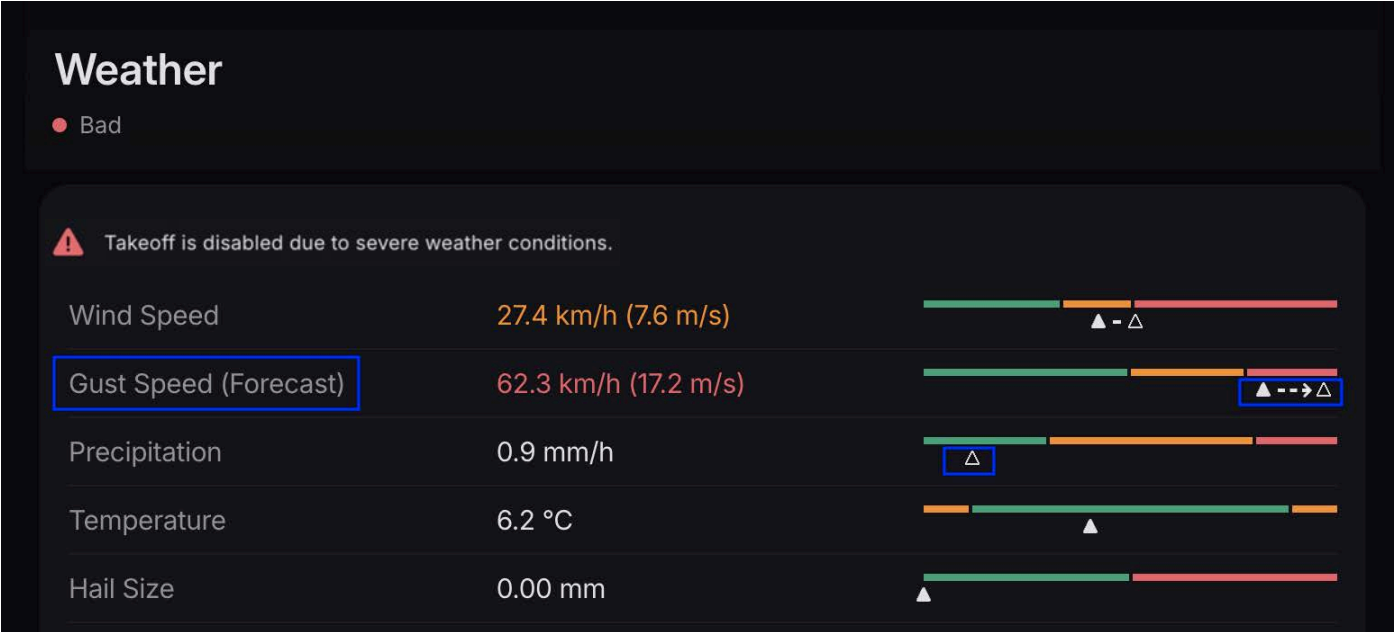


Figure 7-46 Forecasted Value

Caution: Weather Advisories shall be overridden only if the RPIC is in possession of a reliable weather report indicating that weather limitations are not exceeded.

Caution: The RPIC is responsible to ensure that the weather limitations are not exceeded. The built-in weather service may not always be accurate for any time and any location in the world.

7.9.2. Flight Advisory Status

In the Status menu the CS provides a detailed flight advisory report for the installation location of the Hive. If no unacknowledged flight advisories are in effect over the installation site, then the advisory status will be good.

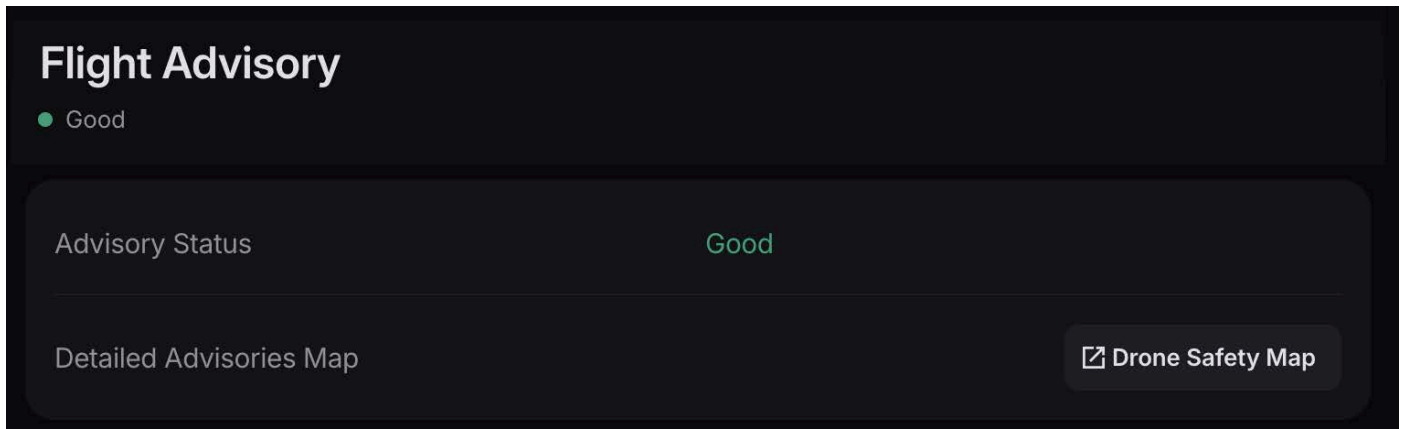


Figure 7-47 - Flight Advisory “Good”

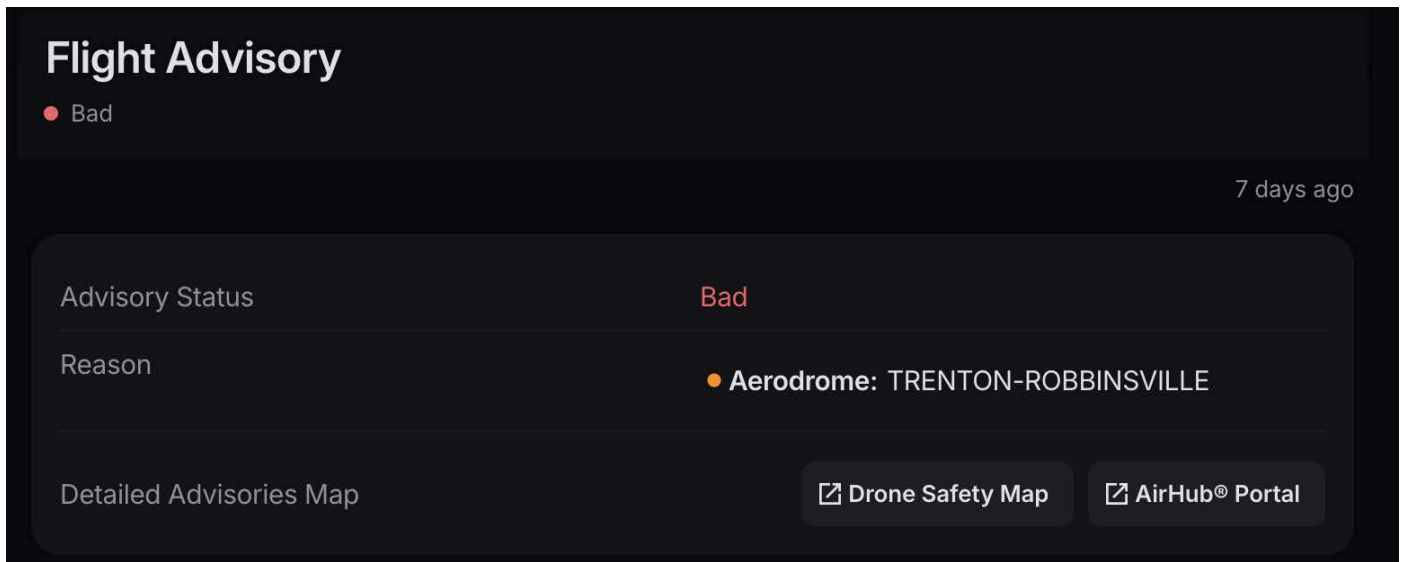


Figure 7-48 - Flight Advisory “Bad”

Note: Flight Advisories will be displayed according to the rules of the country in which the system is installed.

7.9.3. Flight Advisory Overrides and Acknowledgements

7.9.3.1. Overrides

If the remote pilot tries to fly with an active, not acknowledged, flight advisory, the system will display a message indicating the presence of a Flight Advisory and the Bee will be prevented from taking off.

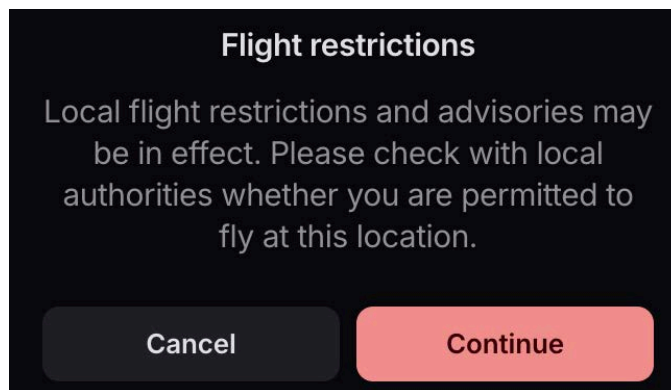


Figure 7-49 - Flight Restriction Message

If the Remote Pilot holds a valid approval, they can override the advisory by selecting **Continue**. This action temporarily disables the restriction for the duration of the current flight. Once the flight concludes, the restriction will automatically be reinstated. To perform subsequent flights in this zone, the remote pilot will need to repeat the override process.

Caution: Flight Advisories shall be overridden only if the RPIC is in possession of an approval.

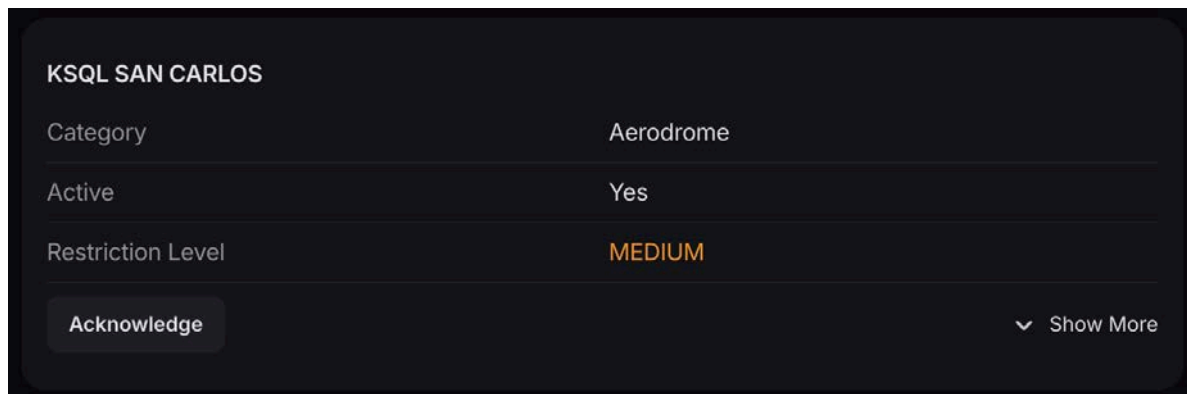
7.9.3.2. Acknowledgments

The preferred way of dealing with Flight Advisories is to acknowledge the Flight Advisories for a specified period of time, based on the expiration time of the agreement from local authorities. This acknowledgment may be withdrawn at any time.

Caution: Flight Advisories shall be acknowledged only if the RPIC is in possession of an approval.

7.9.3.2.1. Acknowledgement of a Flight Advisory

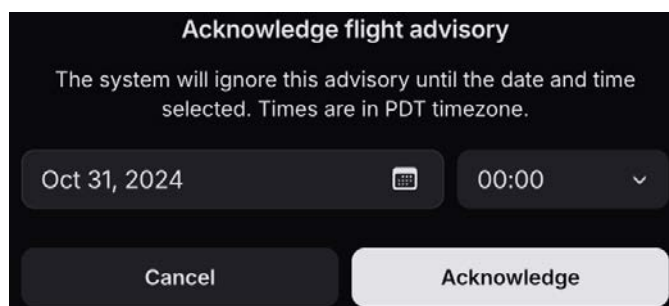
To acknowledge a Flight Advisory, click on the **Hive Menu** button and go to the **Status → Flight Advisory** tab. Then scroll down to the Flight Advisory.



The screenshot shows a dark-themed card for a flight advisory. At the top, it says "KSQL SAN CARLOS". Below this, there are four rows of information: "Category" with the value "Aerodrome", "Active" with the value "Yes", and "Restriction Level" with the value "MEDIUM" in orange text. At the bottom left of the card is a button labeled "Acknowledge". At the bottom right is a link that says "Show More" with a downward-pointing chevron icon.

Figure 7-50 - Flight Advisory

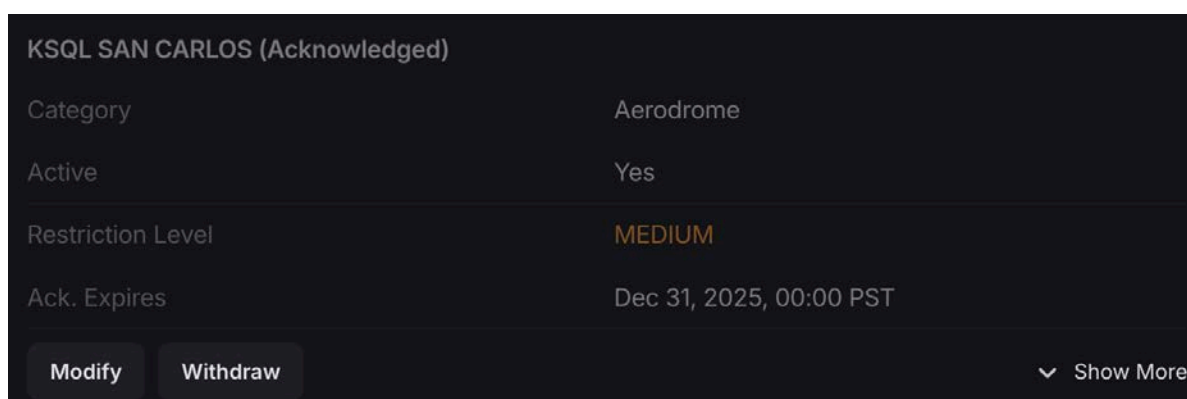
Below the Flight Advisory, click on the **Acknowledge** button.



The screenshot shows a dialog box titled "Acknowledge flight advisory". Inside the dialog, there is a message: "The system will ignore this advisory until the date and time selected. Times are in PDT timezone." Below the message, there are two input fields: a date field showing "Oct 31, 2024" with a calendar icon, and a time field showing "00:00" with a dropdown arrow. At the bottom of the dialog, there are two buttons: "Cancel" and "Acknowledge".

Figure 7-51 - Acknowledgement Window

Choose until when the advisory will be acknowledged and click **Acknowledge**. The Flight Advisory has been acknowledged and you will no longer be prompted at takeoff to override the advisory until it expires or the acknowledgement is withdrawn.

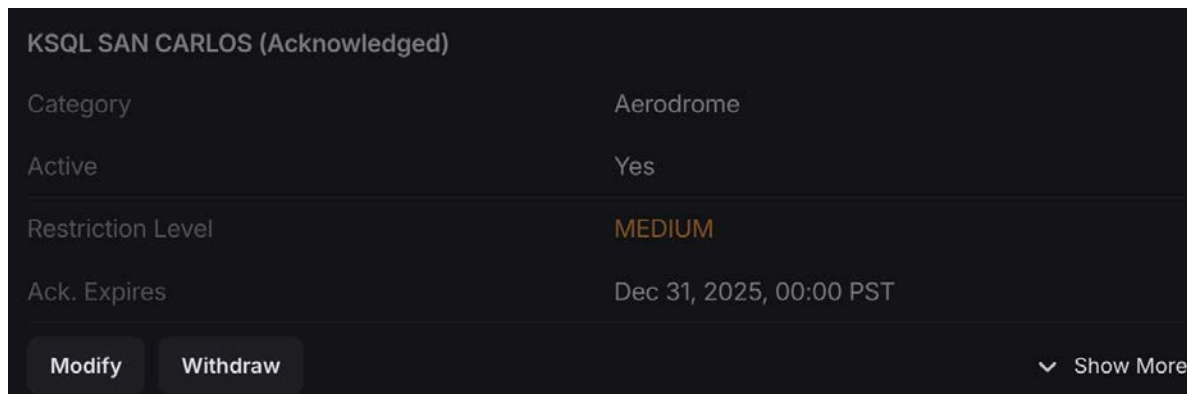


The screenshot shows the same flight advisory card as in Figure 7-50, but now it is titled "KSQL SAN CARLOS (Acknowledged)". The "Ack. Expires" field has been added at the bottom, showing the value "Dec 31, 2025, 00:00 PST". The "Acknowledge" button has been replaced by two buttons: "Modify" and "Withdraw". The "Show More" link remains at the bottom right.

Figure 7-52 - Flight Advisory acknowledged

7.9.3.2.2. Modifying a Flight Advisory Acknowledgement

In order to modify a Flight Advisory acknowledgment click on the **Modify** button below an acknowledged advisory.



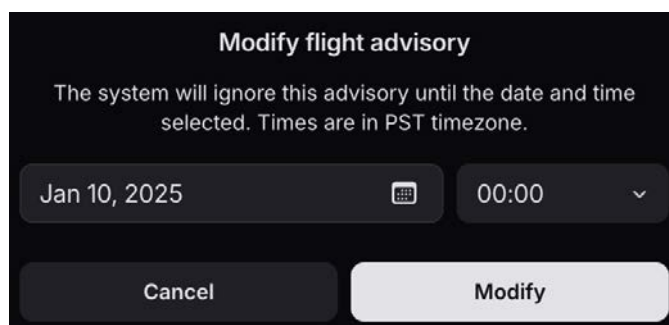
The screenshot shows a flight advisory card for 'KSQL SAN CARLOS (Acknowledged)'. It contains the following information:

Category	Aerodrome
Active	Yes
Restriction Level	MEDIUM
Ack. Expires	Dec 31, 2025, 00:00 PST

At the bottom of the card, there are two buttons: 'Modify' and 'Withdraw'. To the right of these buttons is a link that says 'Show More' with a downward arrow icon.

Figure 7-53 - Flight Advisory acknowledged

Modify the expiration time according to the need and click **Modify**.



The screenshot shows a 'Modify flight advisory' popup. It contains the following information:

Modify flight advisory

The system will ignore this advisory until the date and time selected. Times are in PST timezone.

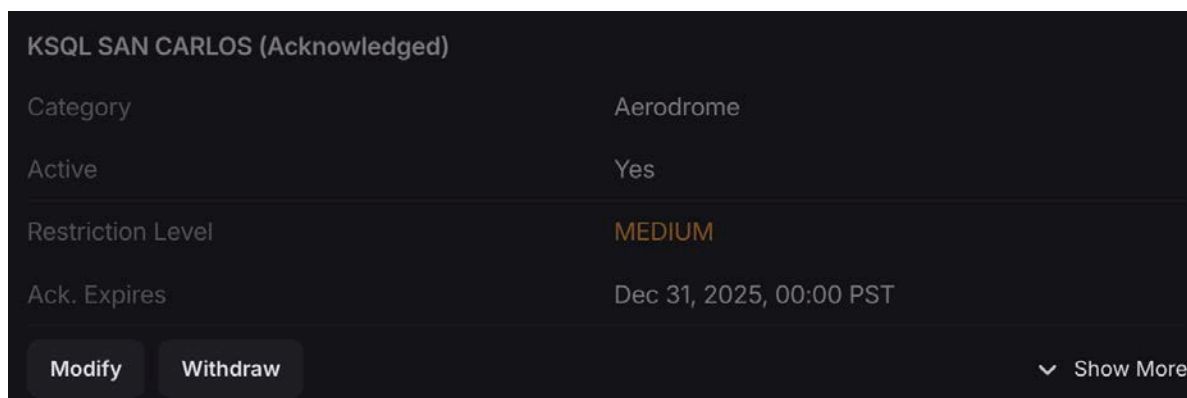
Below the text, there are two input fields: a date field showing 'Jan 10, 2025' with a calendar icon, and a time field showing '00:00' with a dropdown arrow.

At the bottom of the popup, there are two buttons: 'Cancel' and 'Modify'.

Figure 7-54 - Modify Flight Advisory popup

7.9.3.2.3. Withdraw a Flight Advisory Acknowledgement

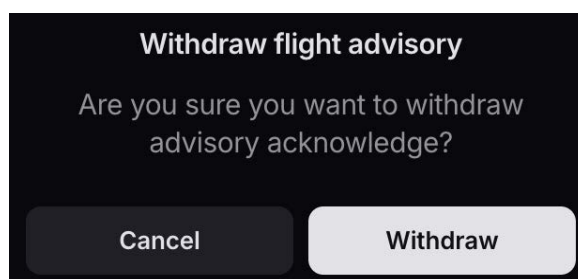
To withdraw an existing acknowledgement, click on the **Withdraw** button below an acknowledged advisory.



KSQL SAN CARLOS (Acknowledged)	
Category	Aerodrome
Active	Yes
Restriction Level	MEDIUM
Ack. Expires	Dec 31, 2025, 00:00 PST
Modify Withdraw Show More	

Figure 7-55 - Flight Advisory Withdraw Button

Confirm that you want to withdraw the flight advisory acknowledgement by clicking **Withdraw**.



Withdraw flight advisory

Are you sure you want to withdraw
advisory acknowledge?

Cancel Withdraw

Figure 7-56 - Flight Advisory Acknowledgement Withdrawal

7.10. Detect and Avoid (DAA) - Optional

7.10.1. General

A Detect and Avoid (DAA) system is a critical component for Unmanned Aircraft Systems, flying in certain portions of airspace, to avoid collisions with other aircraft.

The DAA functionality integrated in the Beehive System uses several feeding sources to make sure that the majority of Air Traffic, even military or private aircraft will be tracked.

The Beehive system contains an internal air traffic receiver and can also be integrated with external air traffic receivers.

Note: *In order to be able to use the DAA, the functionality needs to be set up, configured and enabled.*



Figure 7-57 - DAA Scheme

7.10.2. Functioning

7.10.2.1. The Proximity Bands

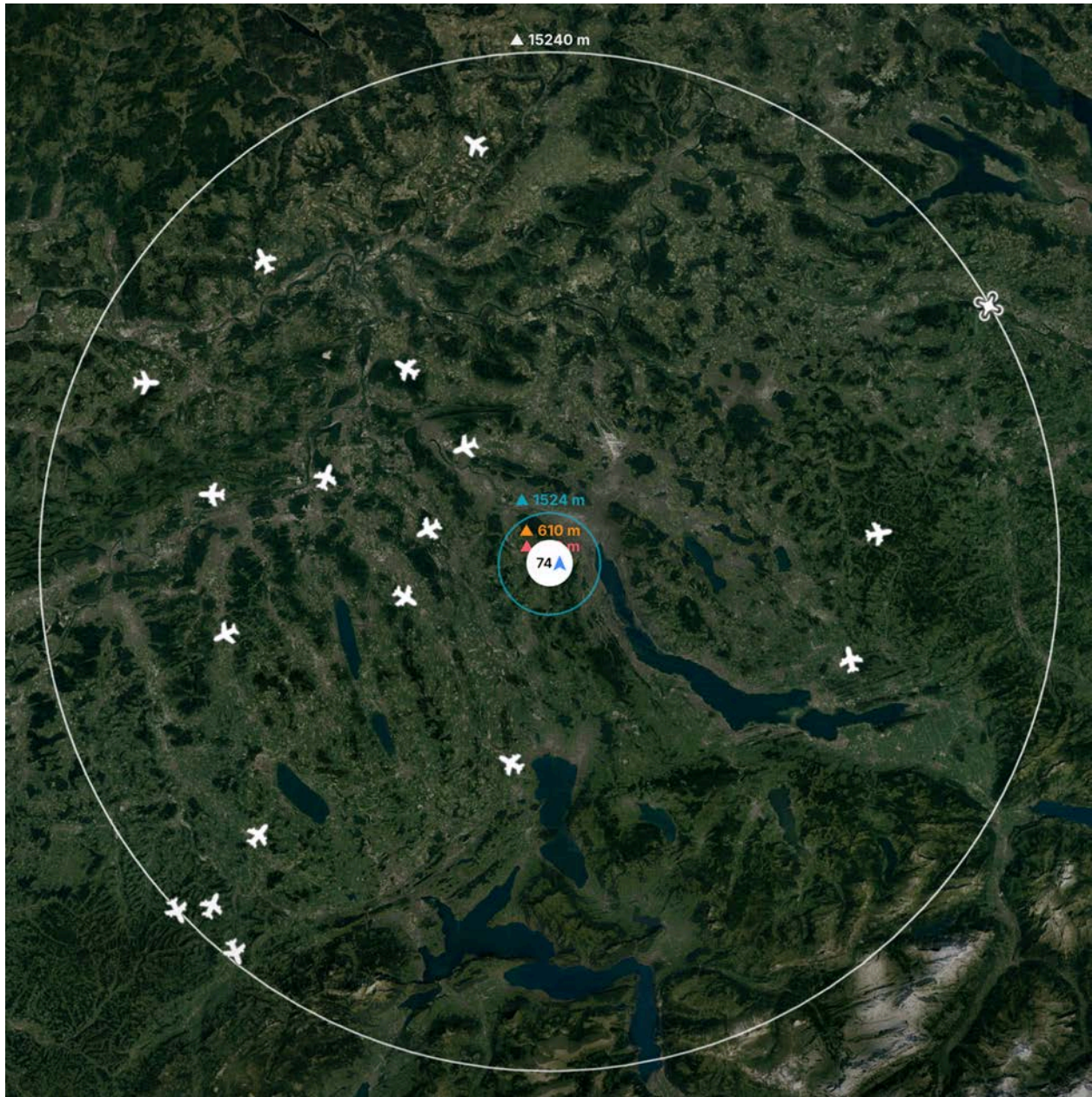


Figure 7-58 - DAA Map Screen

Aircraft within the DAA range of interest are displayed in the map. Once an aircraft enters the area of protected volume of the Bee (4 bands), it will be monitored with increasing intensity as it gets nearer. The area of protected volume of the Bee is a 3 dimensional space in the shape of a cylinder.

- White cylinder: 50 km radius, 15 km vertical separation. Aircraft in this area are not a threat but are displayed on the map. Aircraft outside of this cylinder are not shown.

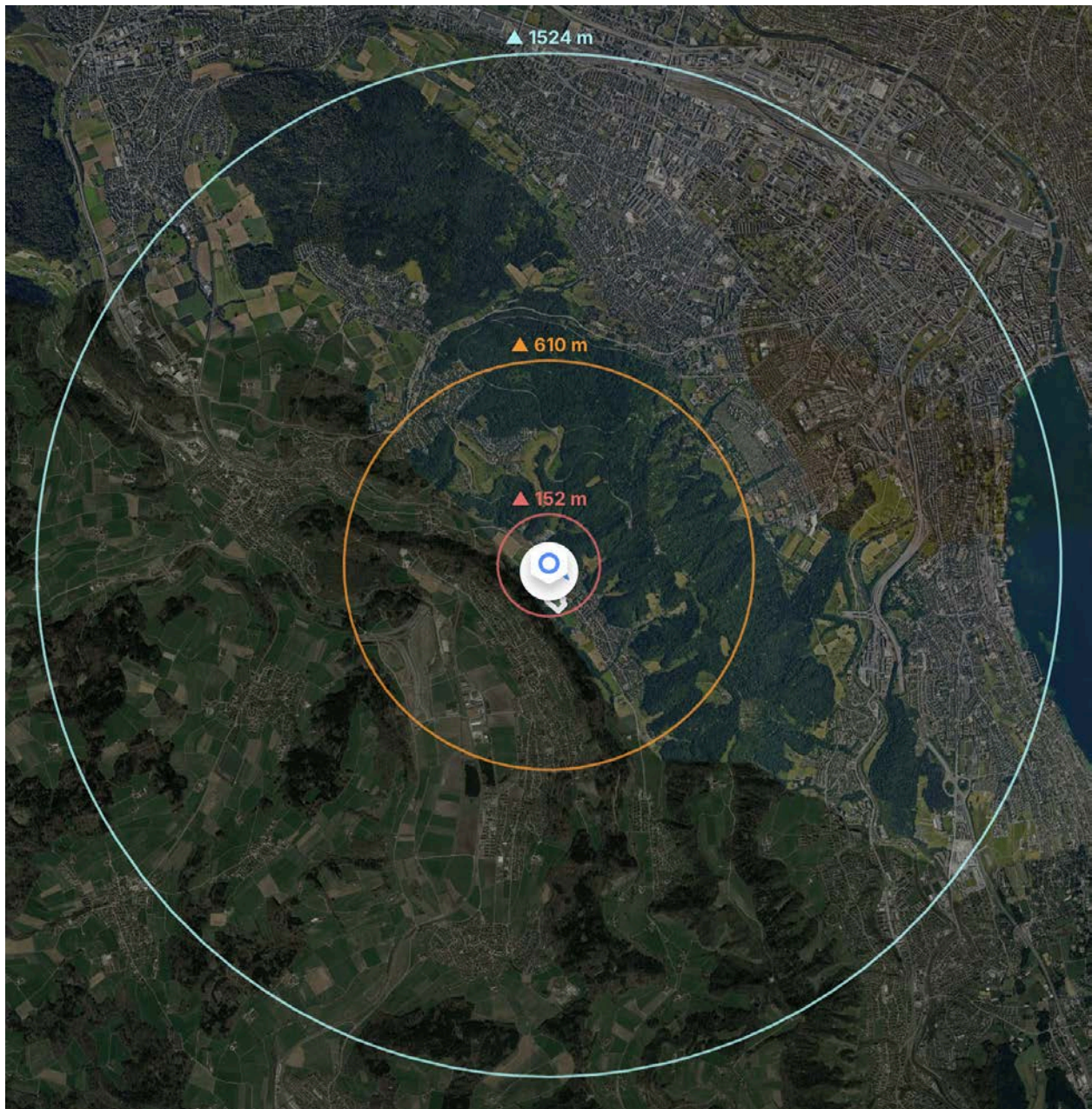


Figure 7-59 - Air Traffic Alert Cylinders

- Cyan cylinder: 5 km radius, 1.5 km (5000 ft) vertical separation. Aircraft in this area are not a threat but they are to be monitored
- Amber cylinder: 2 km radius, 610 meters (2000 ft) vertical separation. Aircraft in this area can become a threat, system will command a **Land in Hive**, if automatic reactions are enabled
- Red cylinder: 0.5 km radius, 152 meters (500 ft) vertical separation. Aircraft in this area are a threat, system will command a **Land in Place**, if automatic reactions are enabled

The air traffic information refresh rate and the rate of the threat assessment is consistently set to 1 second. In the CS, it updates every 10 seconds unless a target enters one of the three innermost cylinders (cyan, amber, or red). In such cases, the information in the CS updates every second.

7.10.2.2. DAA Maneuvers

Depending where the intruder is positioned, vertically and horizontally, the system will show an alert, colored according to the threat level.

Air Traffic

Information

The intruder is within the 5 km radius and/or the 1.5 km vertical separation

Air Traffic

Warning

The intruder is within the 2 km radius and/or the 0.6 km vertical separation

Air Traffic

Critical

The intruder is within the 0.5 km radius and/or the 0.15 km vertical separation

Table 7-16 - Traffic Alerts

If automatic air traffic reactions by the system are disabled, the pilot must act manually and either land the Bee in the Hive (warning) or land the Bee in place (critical).

7.10.2.2.1. Unsafe Modes and Commands during Threat Level Warning and Critical

When the threat level warning is triggered, you have to issue a return to land command. The following modes and/or commands are considered unsafe:

- Inspect
- Patrol
- Operational Checkout flight
- Follow
- Fly-to
- Pause

When threat level critical is triggered, you have to issue a land in place command. In addition to the modes above, the following modes and/or commands are considered unsafe:

- Return To Hive
- High-altitude Return To Hive

7.10.2.3. Types of Air Traffic

The air traffic is displayed on the 2D map according to their category.

The following symbols are used in the 2D map:

	Large Aircraft ($75,000 \geq \text{lbs} < 300,000$) and Heavy Aircraft ($\geq 300,000 \text{ lbs}$)		Rotorcraft
	Large Aircraft (high vortex)		Ultralight/Hang Glider/Paraglider Glider/Motor Glider
	Light Aircraft ($< 15,500 \text{ lbs}$) and Small Aircraft ($15,500 \geq \text{lbs} < 75,000$)		Rockets
	High Performance Aircraft and Jet Fighters		Lighter than air and Balloons
	Unmanned Aircraft		Parachutist/Skydiver

Figure 7-60 - DAA Air Traffic Icons

7.10.2.3.1. Colors

The icon's color corresponds to the threat level, changing dynamically based on the intruder aircraft's position within the protected volume area.

			
Shown on map	Information	Warning	Critical

Figure 7-61 - DAA Traffic Icon Colors

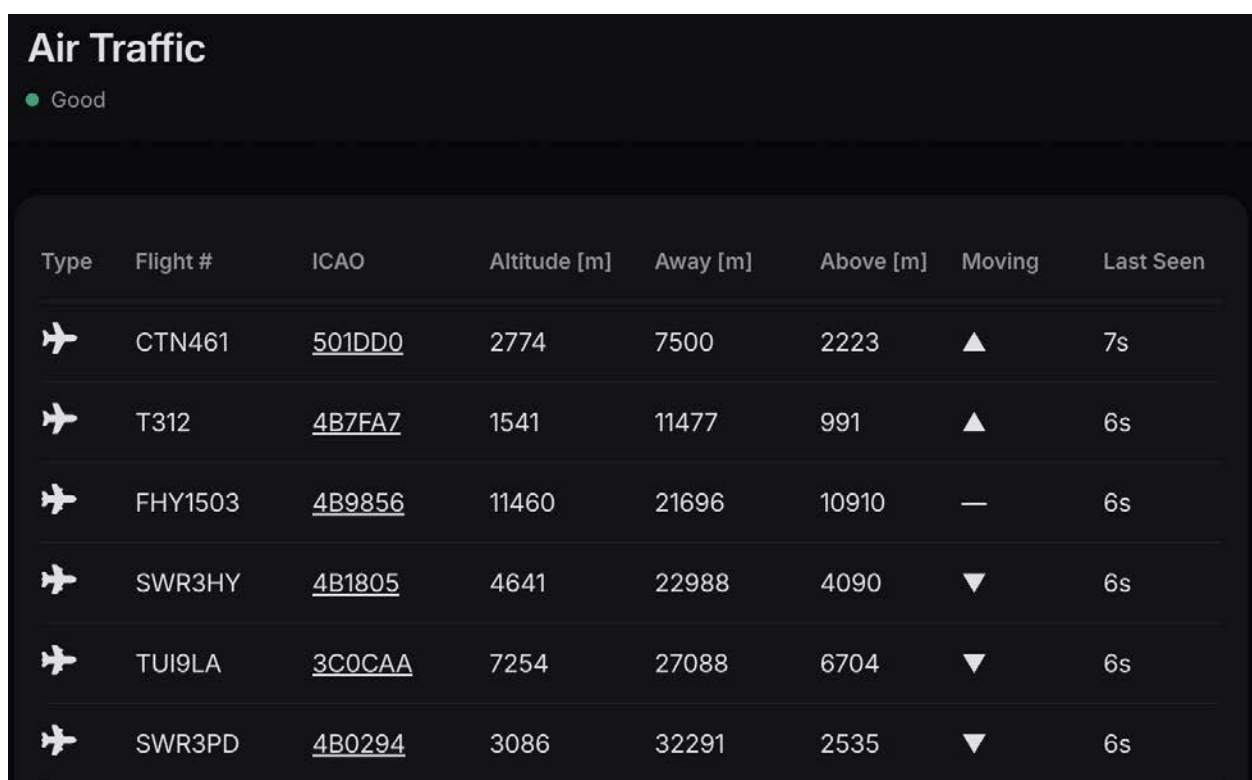
7.10.2.4. List of Air Traffic

For the users that have the Detect and Avoid system installed and enabled, a list of aircraft detected by the system is available on the **Status** → **Air Traffic** page.

The list shows all the aircraft that are passing through one or more of the DAA proximity rings, and is composed of:

- Category of aircraft
- Flight Number/Aircraft Registration
- Unique Identifier (ICAO)
- Altitude
- Vertical separation in meters
- Horizontal separation in meters
- Climbing/Descending
- Age of report in seconds

Depending on the horizontal and/or their vertical separation from the Bee, the aircraft and its details will be displayed in either white, cyan, amber or red.



Type	Flight #	ICAO	Altitude [m]	Away [m]	Above [m]	Moving	Last Seen
✈	CTN461	<u>501DD0</u>	2774	7500	2223	▲	7s
✈	T312	<u>4B7FA7</u>	1541	11477	991	▲	6s
✈	FHY1503	<u>4B9856</u>	11460	21696	10910	—	6s
✈	SWR3HY	<u>4B1805</u>	4641	22988	4090	▼	6s
✈	TUI9LA	<u>3C0CAA</u>	7254	27088	6704	▼	6s
✈	SWR3PD	<u>4B0294</u>	3086	32291	2535	▼	6s

Figure 7-62 Aircraft Table displaying different colors

7.11. System Controls

7.11.1. Bee Controls

The following controls are associated with the control of the unmanned aircraft

7.11.1.1. Physical Power On/Off Pushbutton

The Bee has a single pushbutton switch. This switch is used for powering up/down the Bee.



Figure 7-63 - Bee power on/off switch

The power button will turn the Bee on when it is off. To switch off the Bee, this button must be held for 4 seconds.

7.11.1.2. Bee Power Controls

The **Settings** → **Power & Controls** page provides a button to reboot the Bee and a button to shut down the Bee completely.

Refer to section [Settings](#) for details.

7.11.1.3. Bee Mission Controls

The UAS provides four types of different missions:

- **Inspection Mission** The Bee is sent to inspect a particular, pre-defined location on the property. An inspection mission is executed by clicking the **Missions** button and then selecting the desired location.
- **Patrol Mission** The Bee is sent to patrol a particular, pre-defined route over the property. A patrol mission is executed clicking the **Missions** button and then selecting the desired route.
- **Fly-to Mission** The Bee is sent to inspect an ad hoc location on the property. A fly-to mission is executed by clicking the **Fly to** button and then selecting the location on the map.
- **Follow Mission** The Bee is told to follow an object (e.g. a person) across the property. A follow mission is executed by clicking on the **Follow** button in the popup dialog that is shown when an object is detected.

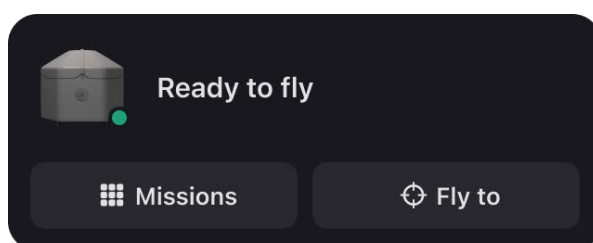


Figure 7-64 - Bee Mission Control switches

Note: *Configuring inspection locations and patrol routes requires administrative privileges to the system. Refer to the UAS Installation Manual [[Ref. 1](#)].*

7.11.1.3.1. Inspection Mission Controls

An inspection mission can be executed by clicking on the **Missions** button, then selecting the **Inspect** tab, and then selecting the desired location from the list.



Figure 7-65 - Inspect Tab

The list of locations presents all the pre-defined locations for the property along with a preview of what the Bee will see at the destination. By default, the pre-defined locations are sorted alphabetically by their assigned names. The sort order may be changed by selecting a different order from the dropdown menu. The search bar provides a convenient way to quickly find a location with a particular name.



Figure 7-66 - Hive Search Bar

The view of the location may be changed from **grid view** to **list view** by clicking on the button on the top-right.

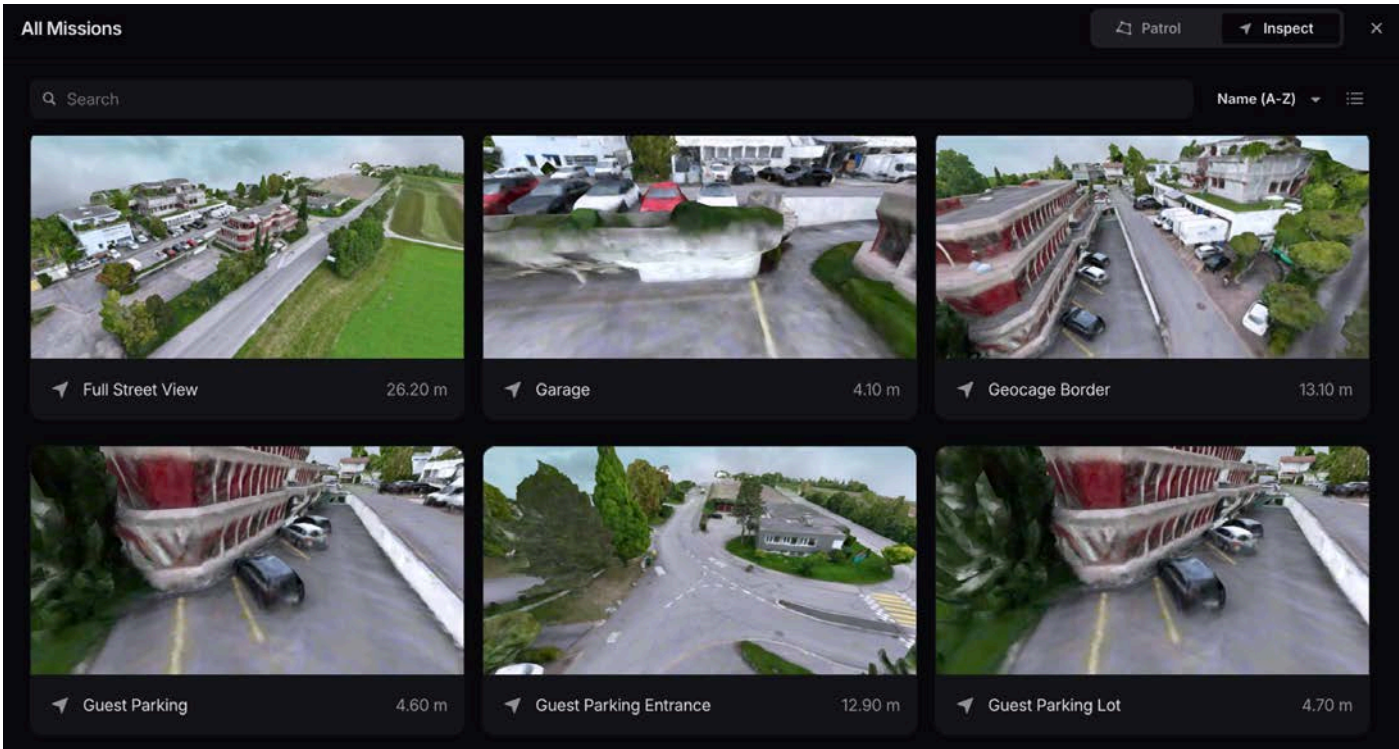
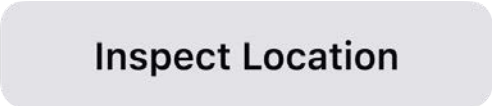


Figure 7-67 - Inspection Mission Selector Panel

Next, select the desired location from the list. The CS will show a preview of the selected location. Confirm that the location is the



desired one and then click on the **Inspect location** button to execute the inspection mission.



Figure 7-68 - Inspection Mission Preview

7.11.1.3.2. Patrol Missions

A patrol mission can be executed by clicking on the **Missions** button, then selecting the **Patrol** tab, and then selecting the desired route from the list.



Figure 7-69 - Mission Selector Button

The list of routes presents all the pre-defined routes for the property along with a preview of the route. The sort order and view may be changed just as for the list of locations (see above). The search bar provides a convenient way to quickly find a route with a particular name.

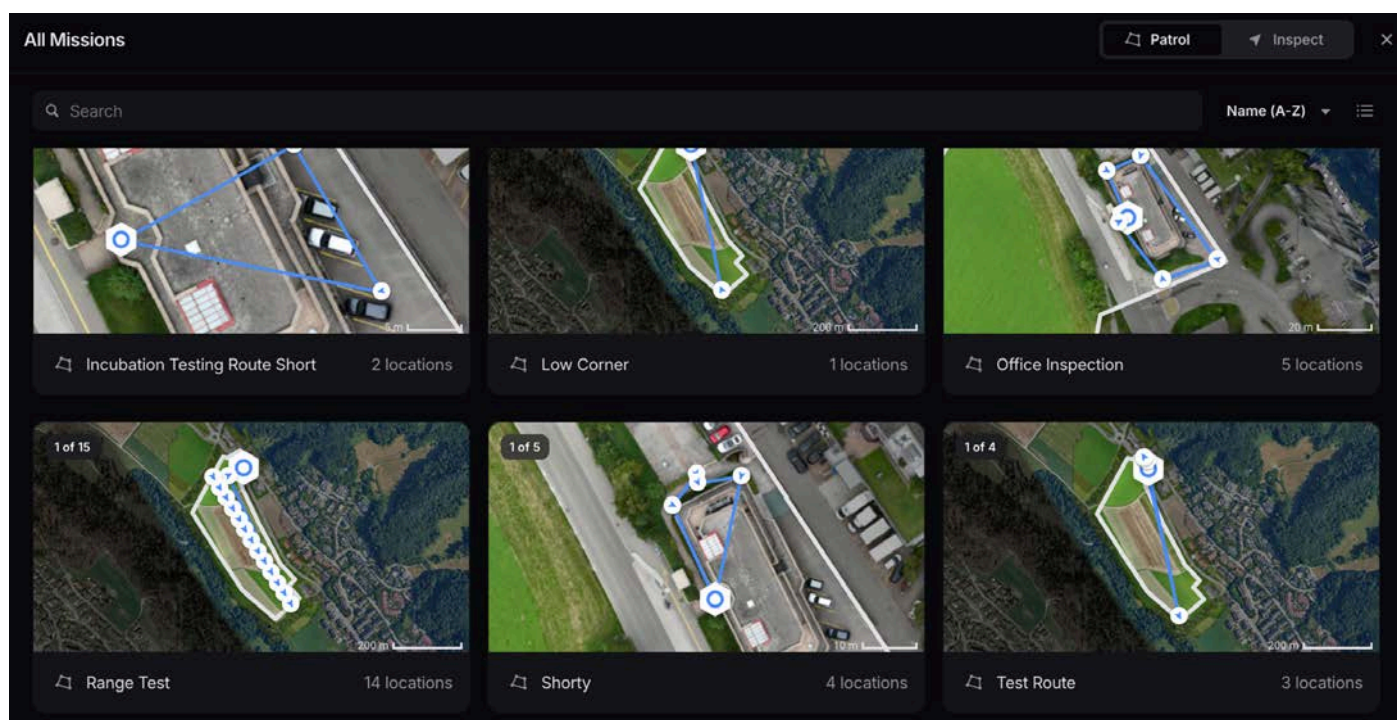


Figure 7-70 - Patrol Mission Selector Panel

Next, select the desired patrol from the list. The CS will show a preview of the selected route.

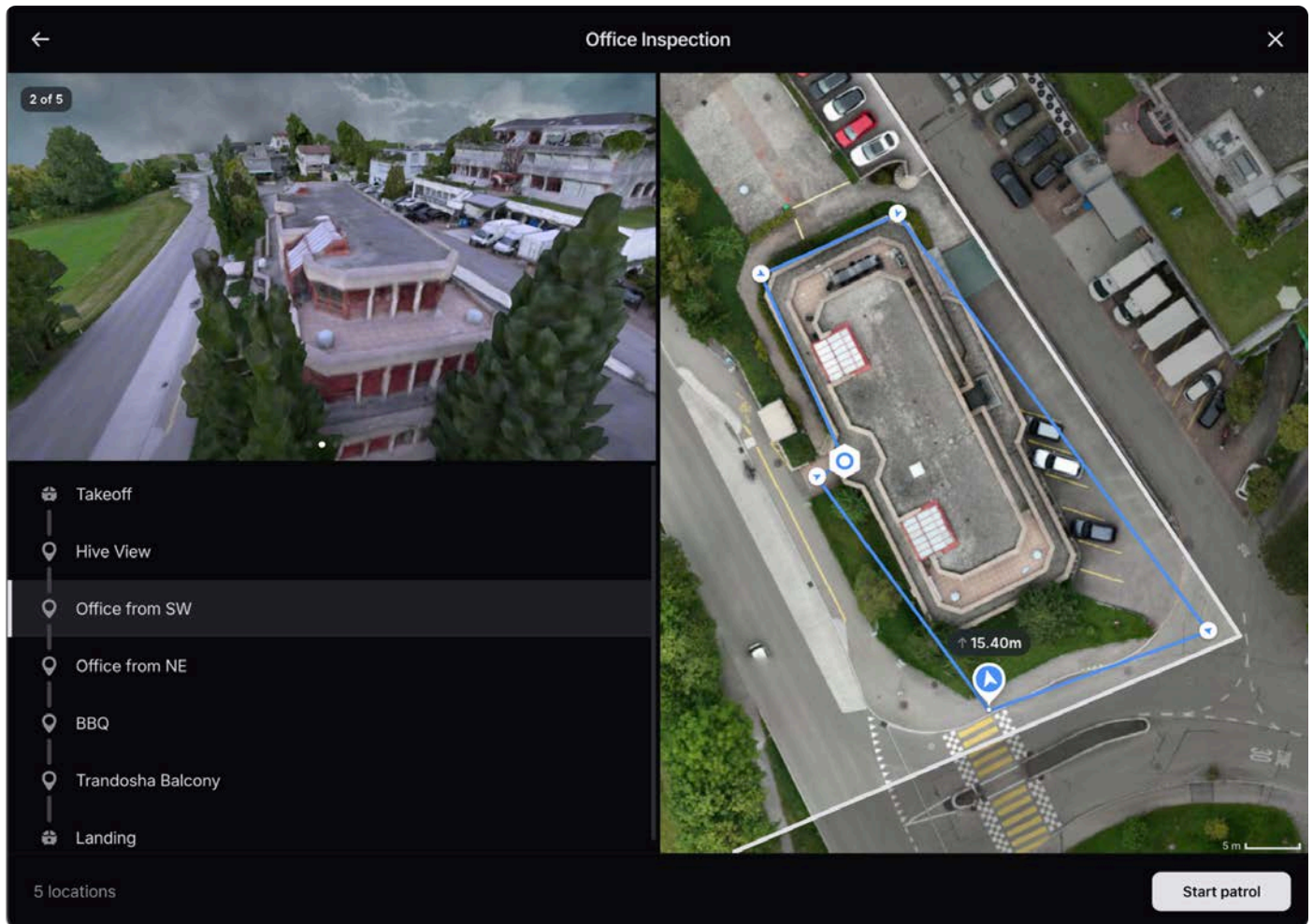


Figure 7-71 - Patrol Mission Preview

By hovering over the individual locations in the route, one can preview what the Bee sees at each stop on the route.

Confirm that the route is the desired one and then click on the **Start patrol** button in the lower right corner to execute the patrol mission.

Start patrol

After the Bee has visited all locations of a route, the Bee will automatically return to the Hive and land. No pilot action is required.

7.11.1.3.3. Fly-to Missions

A Fly to mission allows the pilot to select the inspection location by double-clicking on any spot in the 2D map or the 3D map, or by double-clicking somewhere in the video window once the Bee is flying.

In order to perform a fly to mission, activate the fly to function by clicking the **Fly to** button. To deactivate the fly to function, click the **Fly to** button again. The state of the button indicates whether the fly to function is active or not.



Figure 7-72 - Fly to Function Active

Once the fly to function has been activated, double click on the desired spot on the map or the video window. An orange marker is shown on the map where the map was clicked and the Bee will immediately start flying towards the marked location. Confirm in the map that the correct fly to location is shown.

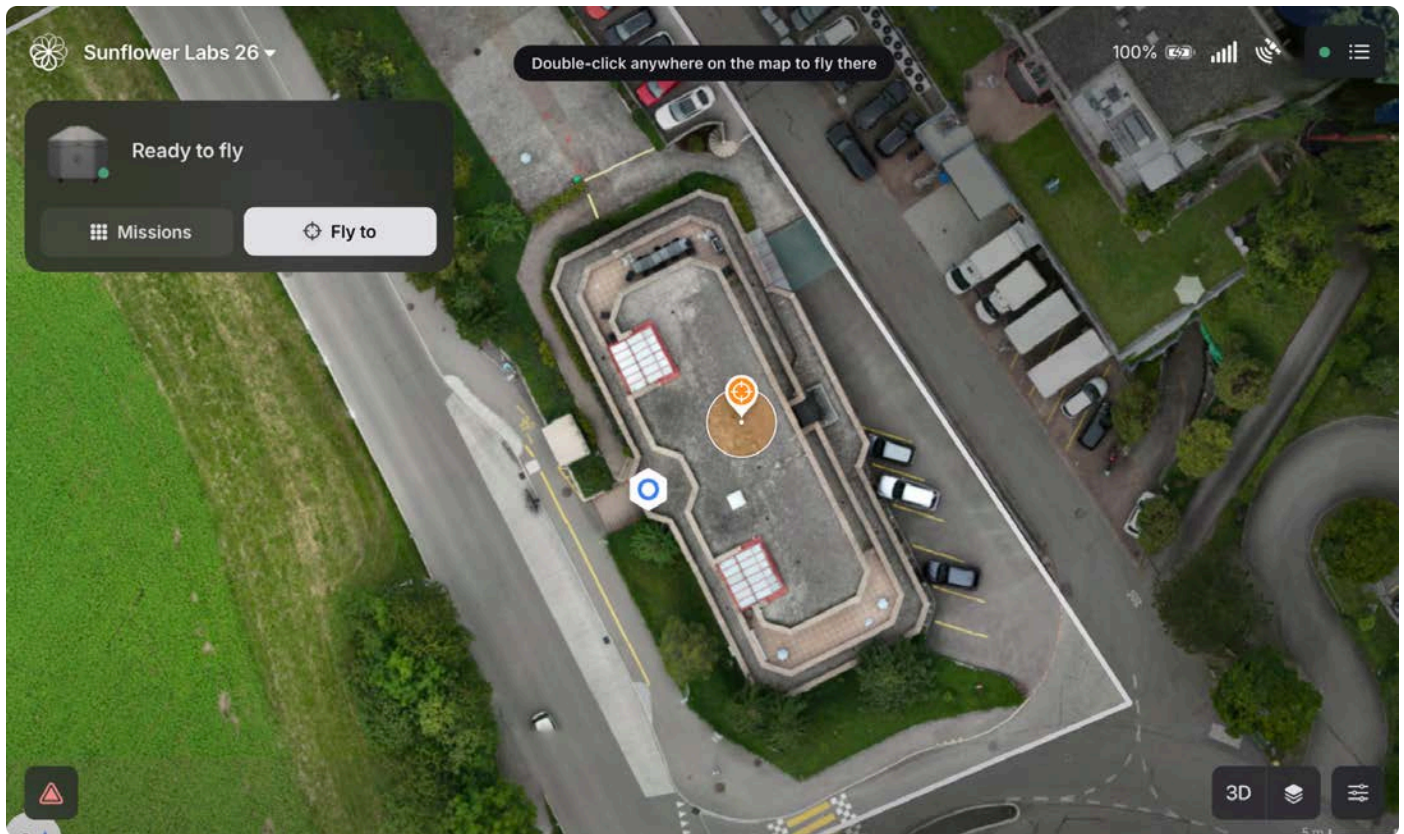


Figure 7-73 - Active Fly to location in the 2D map

Note: The selected fly-to location is the location that Bee will look at and not the location where the Bee will fly to. The UAS mission planning function will automatically decide where the Bee should fly in order to observe the clicked location, depending on the obstacles and the geocage of the property.

7.11.1.3.4. Follow Missions

The UAS is capable of detecting and tracking people in the video feed from the Bee. If people are detected (and this feature is enabled) the detected people will be indicated in the video window and a popup message will be shown in the top-right corner of the CS.

Additionally, targets can be sent to the system from externally using the REST API [\[Ref. 3\]](#). These targets can then also be selected for following.

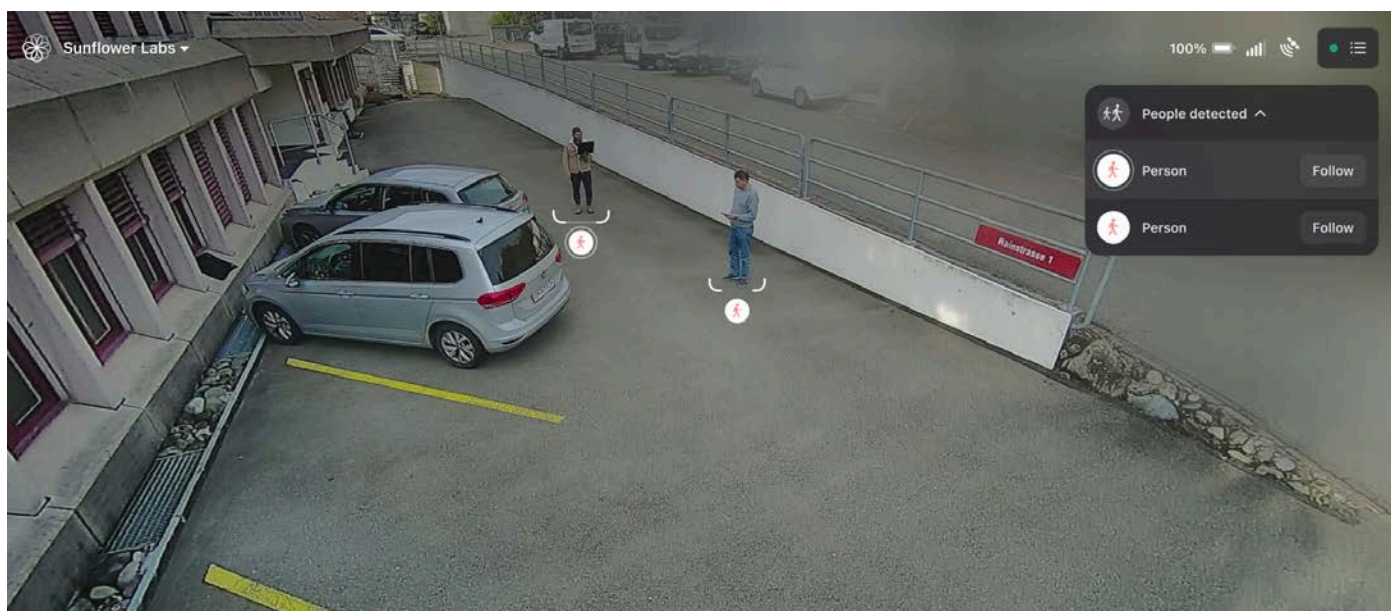
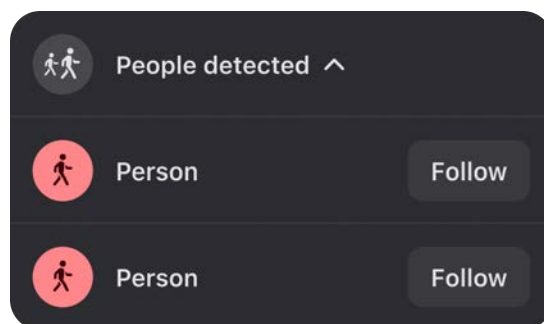


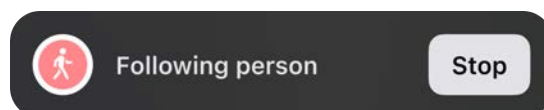
Figure 7-74 - Target Detection

To follow a person, click the **Follow** button, click on the icon below the person, or click on the people icon in the map.

If multiple people are detected. Either click on the icon below the person you want to follow, click on the people icon of the person you want to follow, or first hover over the person you want to follow in the video and then click the Follow button in the popup menu that is highlighted.



To stop following a person, click the **Stop** button in the top right, command the Bee to **Land**, or send it on another **Mission**.



7.11.1.4. Landing and Pause Controls

While the Bee is in flight, the **Land**, the **Pause**, and the **Mission** control buttons are shown in the lower left corner of the CS next to the **Emergency** button.

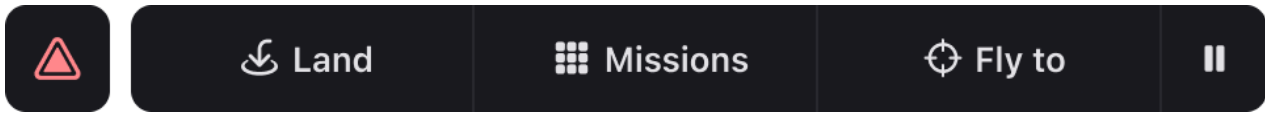


Figure 7-75 - Bee Mission Control Buttons (in flight)

7.11.1.4.1. Land Button

The **Land** button commands the Bee to return to the Hive and perform its standard precision landing approach.

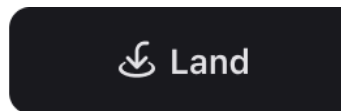


Figure 7-76 - Land Button

After clicking the **Land** button, the land command needs to be confirmed.

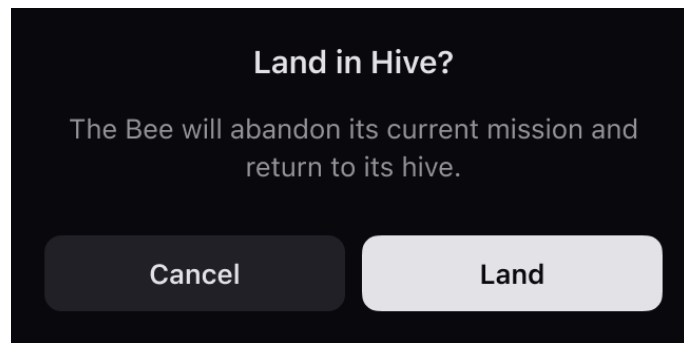


Figure 7-77 - Land command confirmation

7.11.1.4.2. Pause Button

The **Pause** button will command the Bee to stop and hover in place and suspend following the flight plan.

The **Pause** button can be used during Normal Operations as well as during Emergency Return To Land. If the **Pause** button is pressed during normal operations, the Bee will show the state **Paused**. If the **Pause** button is pressed during an emergency, it will show the state **Emergency Paused**.

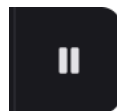


Figure 7-78 - Pause Button



Figure 7-79 - Emergency Pause Button

If the **Pause** command is issued during Take Off or Landing, the Bee will enter the takeoff mode and ascend to the minimum safe takeoff altitude above the CS (or stay at the current altitude if it's already above).

While in the paused state, the flight mode annunciation will keep showing what the Bee was doing before it was paused and what it will be doing when it is unpaused, e.g. on patrol. However, the word **(paused)** will appear next to the mission name. The pause button will be replaced by the resume button.

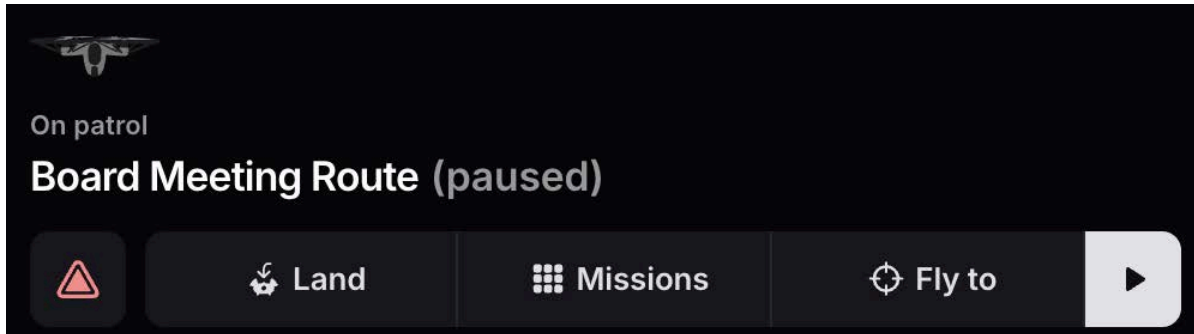


Figure 7-80 - Flight Mode Annunciation in Paused State

Caution:

Pausing is prohibited during critical failures which require landing (e.g. battery error, failure of all gyroscopes/accelerometer sensors, etc.)

Caution:

*Regular missions and reposition commands are prohibited when the Bee is in **Emergency Paused** state.*

7.11.1.4.3. Resume Button

The **Resume** button (the play button) is only shown while the Bee flight is in **Paused** mode. The **Resume** button commands the Bee to resume the mission that it was on before it was paused.



Figure 7-81 - Resume Button



Figure 7-82 - Emergency Resume Button

7.11.1.5. Camera Controls

While the Bee is in flight, the camera and vehicle position adjustment controls can be displayed by clicking on the camera control button. Clicking on the button again will hide the controls.



The camera controls will be shown in the middle-left of the CS.

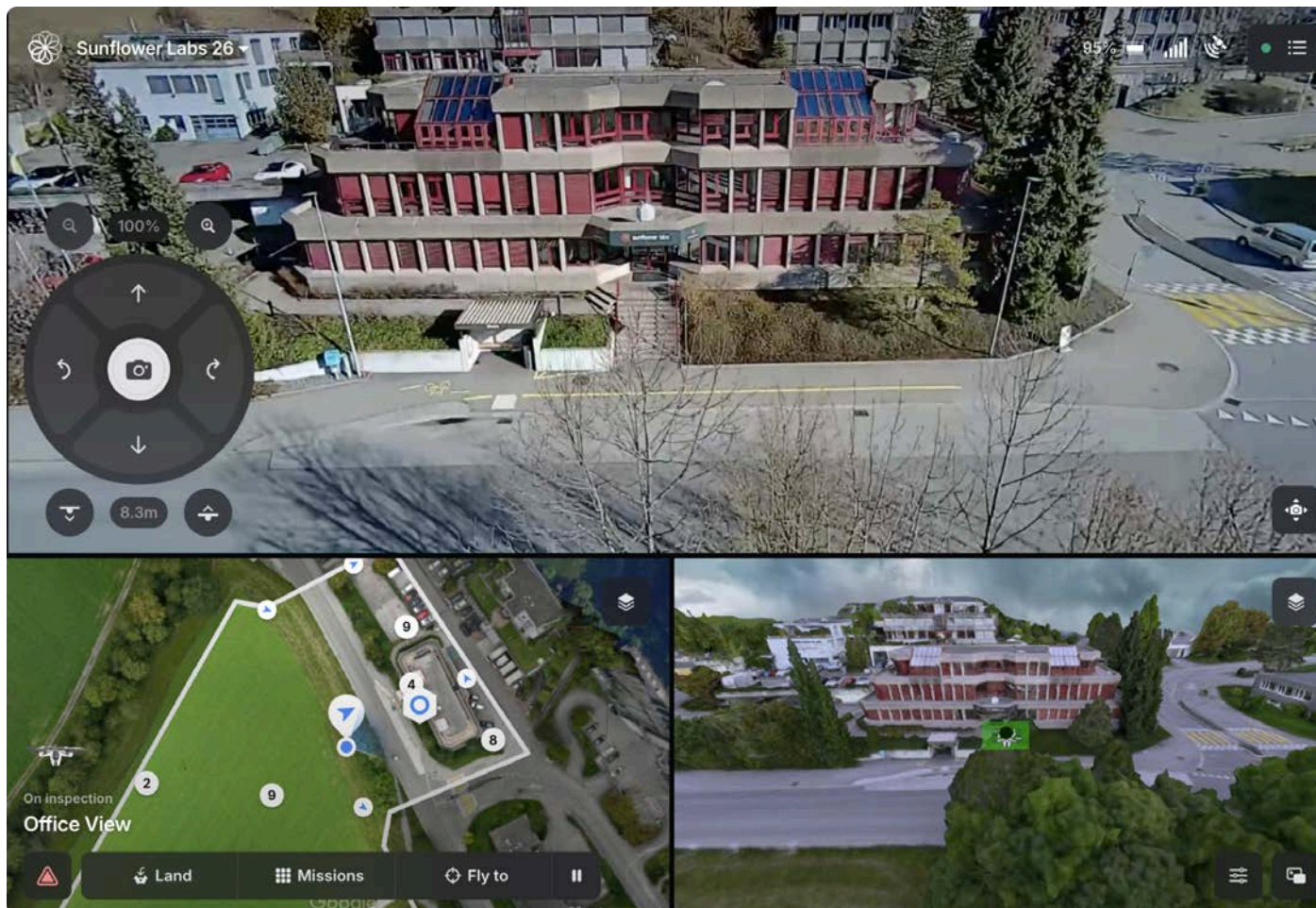


Figure 7-83 - Camera Controls in CS



Figure 7-84 - Camera and vehicle position adjustment control switches

7.11.1.5.1. Snapshot Button

The **Snapshot** button commands the Bee to take a snapshot of what the camera is currently seeing.



Figure 7-85 - Snapshot button

7.11.1.5.2. Rotate Control Buttons

The **Rotate** buttons command the Bee to rotate counterclockwise or clockwise. This results in a panning action of the camera view.



Figure 7-86 - Rotate control buttons

7.11.1.5.3. Forward and Back Buttons

The **Forward** and **Back** buttons command the Bee to fly a discrete increment forward or backward. This movement is limited by the planning volume of the Bee and by the obstacles on the property.



Figure 7-87 - Forward and Back Buttons

7.11.1.5.4. Altitude Control Buttons

The **Altitude** buttons command the Bee to increase or decrease its altitude. This altitude is limited by the planning volume of the Bee and changed with a predefined increment only. This action is only allowed once the Bee has reached its target zone.

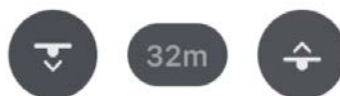


Figure 7-88 - Altitude control buttons

7.11.1.5.5. Zoom Control Buttons

The **Zoom** buttons zoom the video in or out by predefined stops.



Figure 7-89 - Zoom control buttons

7.11.1.6. Save Location

After performing a Fly to mission or repositioning the Bee with the on-screen camera controls, one might want to save the current location permanently as a pre-defined mission location.

In order to accomplish this, click the **Save** button in the lower-left corner of the CS, specify a **Name** for the location, and then confirm by clicking the **Save** button. The location will then be available from the list of pre-defined locations in the Missions menu.

Note: *The save function requires administrative privileges to the Hive.*

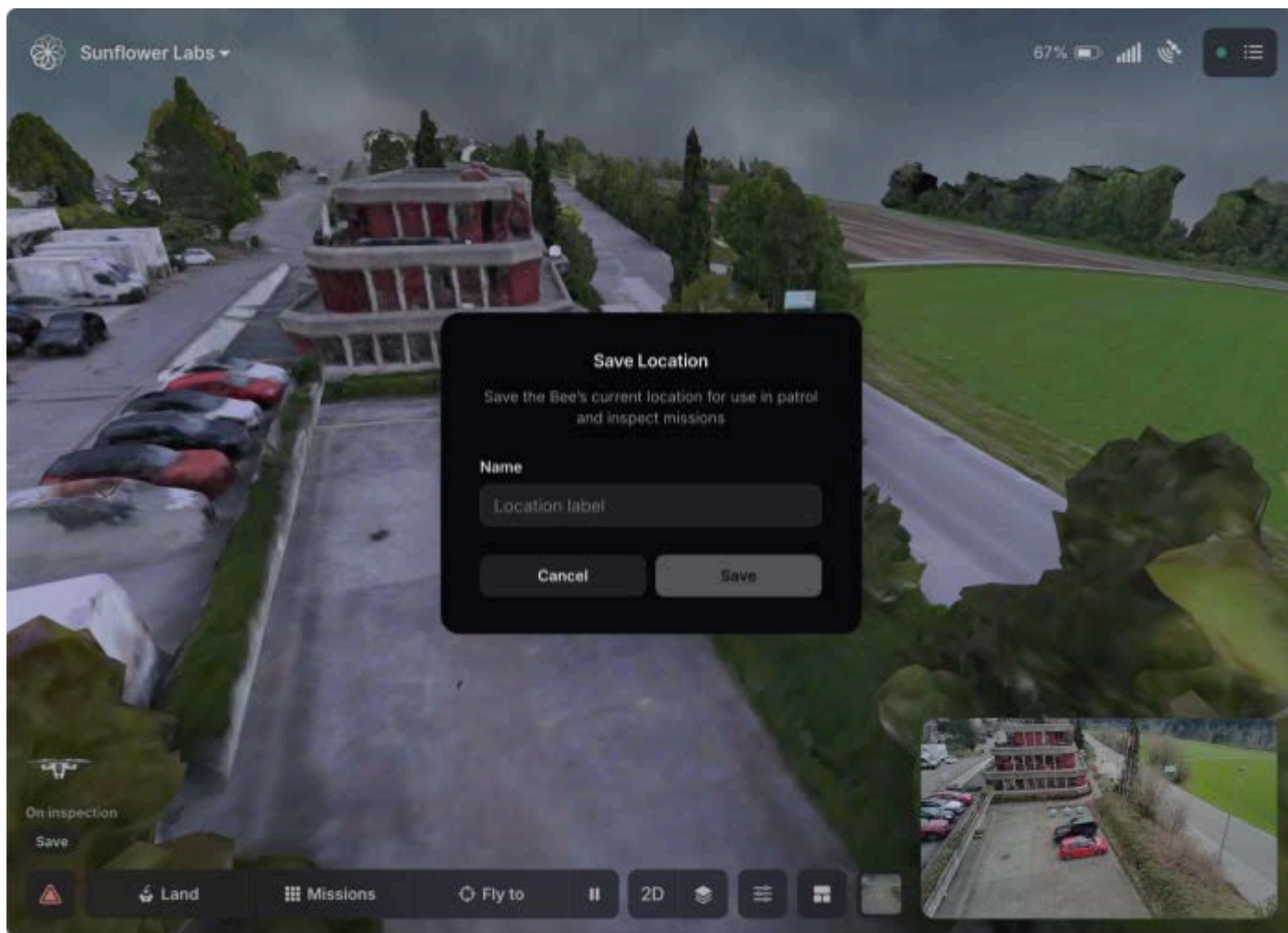


Figure 7-90 - Save a Location

7.11.1.7. Camera Settings

The camera offers several different settings that can impact the user experience and affect the quality of the video stream.

You can access the camera options menu by clicking on the **camera settings** button in the lower-right corner of the CS.

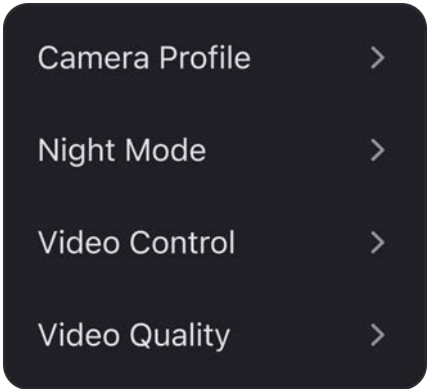


Figure 7-91 - Camera Settings

7.11.1.7.1. Camera Profile

The camera offers several profiles, based on the light conditions.

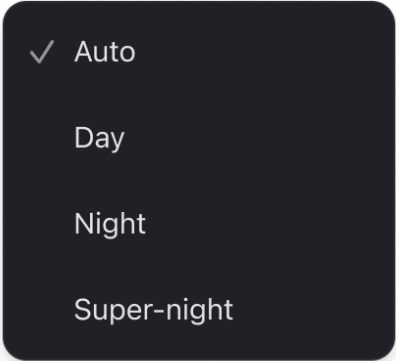


Figure 7-92 - Camera Profile Options

By default, the camera profile option is set to **Auto**. In the automatic mode the Bee will determine which mode to use depending on the current lighting conditions. The pilot can manually select a different mode by clicking on the desired option from the list.

Camera Profile	Description
Auto (Recommended)	The camera settings automatically switch between Day and Night profiles based on the lighting conditions.
Day	The camera settings are optimized for flights in daylight conditions.

Camera Profile	Description
Night	The camera settings are optimized for flights in low-light conditions.
Super-night	The camera settings are optimized for flights where Night profile is not sufficient (e.g. in very low-light conditions).

Table 7-17 - Camera Profile Configurations

7.11.1.7.2. Night Mode

The night mode of the camera determines when the camera on the Bee will turn on its low-light mode. In low-light mode the camera enters its black-and-white mode.

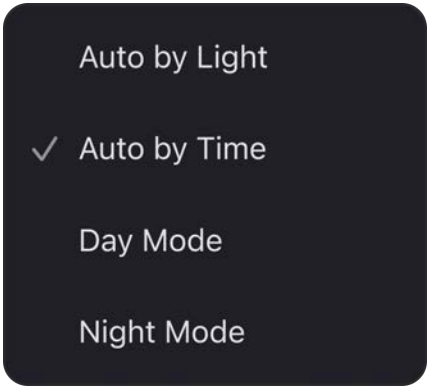


Figure 7-93 - Camera Night Mode

The following four options are available for the Night Mode configuration:

Night Mode	Description
Auto by Light	The camera on the Bee will automatically switch day and night modes depending on the amount of ambient light. If in marginal lighting conditions, this mode may result in the camera switching in and out of night mode.
Auto by Time	The camera on the Bee will automatically switch day and night modes depending on the sunset and sunrise times at the installation location.
Day Mode	The camera on the Bee will always remain in day mode
Night Mode	The camera on the Bee will always remain in night mode

Table 7-18 - Night Mode Configurations

7.11.1.7.3. Video Control

The video control options allow the pilot to test video performance and video transmission. These controls may be useful when debugging networking or other performance issues.

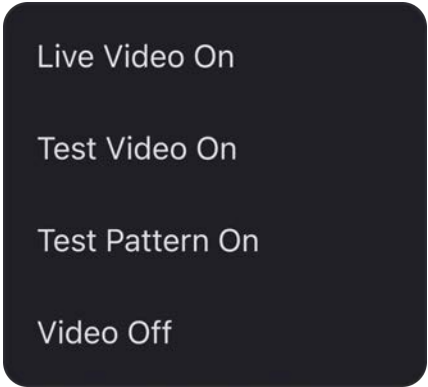


Figure 7-94 - Video Control

The following four options are available:

Video Control	Description
Live Video On	Streams live video from the Bee camera.
Test Video On	Streams a test video from the Hive. This is a higher bandwidth stream that shows a simple test video.
Test Pattern On	Streams a test pattern from the Hive. This is a low bandwidth stream that shows a bouncing ball and is useful to identify stutter in the network connection.
Video Off	Turn the live or test video off

Table 7-19 - Video Controls

7.11.1.7.4. Video Quality

The quality of the video stream depends on the speed and reliability of the internet connection to the Hive and the CS. it is advised to use a Stream Quality compatible with the quality of the internet connection (i.e. if there is slow internet speed set the Stream Quality to Low)

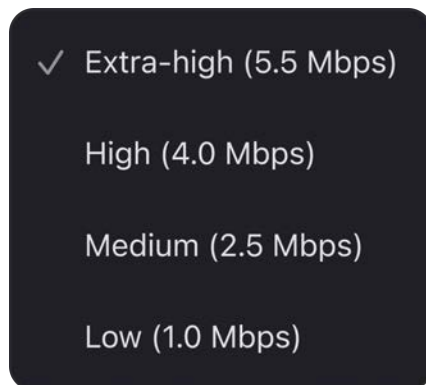


Figure 7-95 - Camera profile Menu expanded

The following options are available:

Stream Quality	Description
Extra-high	The quality of the stream (level of detail and clarity) is very high.
High	The quality of the stream (level of detail and clarity) high
Medium	The quality of the stream (level of detail and clarity) average
Low	The quality of the stream (level of detail and clarity) is low

Table 7-20 - Stream Quality Configurations

7.11.1.8. Emergency Controls

The **“Emergency”** button is always visible in the lower left corner of the CS, whether the Bee is in flight or not. This button brings up all emergency controls and also includes the regular **Land** option.



Figure 7-96 - Emergency Controls

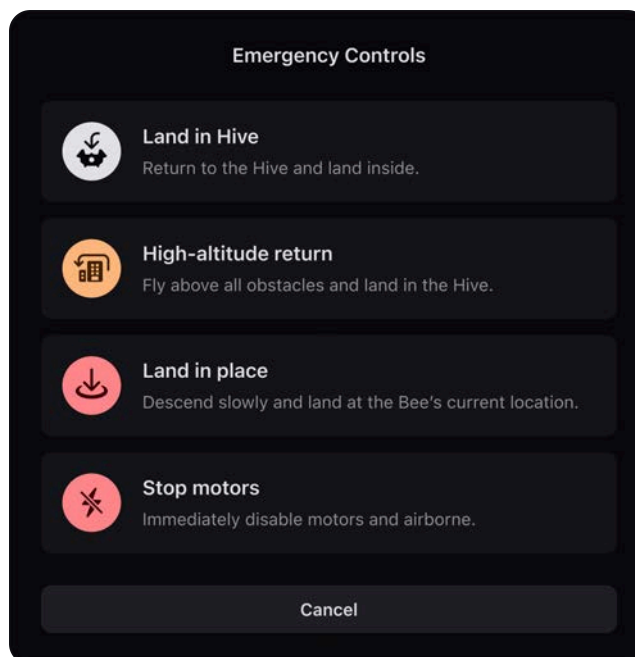


Figure 7-97 - Emergency popup menu

The **Emergency** button provides a selector to choose from performing:

Command	Action
Land in Hive	Initiates the normal return of the Bee to the Hive and executes a precision landing into the Hive. This is the same as clicking the Land button in the Hive when the Bee is in flight.
High-altitude return	Initiates the Bee return to the Hive above all obstacles and conducts a precision landing in the Hive. The indication will then be Returning fallback . This command should be executed when there are unexpected and unmapped obstacles on the property or if the Bee experiences large altitude errors.
Land in place	Initiates a controlled, vertical descent to land the Bee at its current location . The Bee will descend slowly until it touches the ground. Once it detects the landing on the ground it will shut off the motors. If the motors are not shut off automatically, command the Bee to Stop motors (see below).
Stop motors	Shuts down the motors , resulting in the Bee descending in freefall if in flight.

Table 7-21 - Emergency Controls

In order to mitigate risk associated with human errors controlling the Bee in emergency mode, emergency actions must always be confirmed before it is executed. All emergency operations take 3 button clicks by the pilot until the Bee is commanded to enter an emergency procedure, i.e., clicking the emergency button, selecting the desired emergency control, and confirming the emergency action.

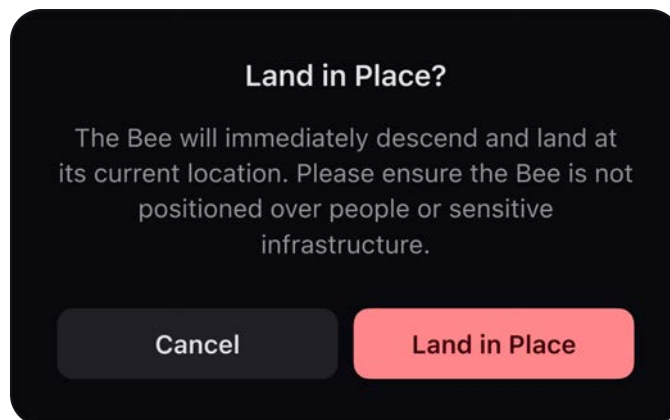
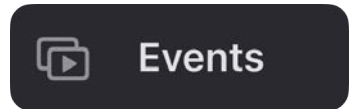


Figure 7-98 - Confirmation window for Emergency mode

7.11.2. Events

The flight history can be seen in the **Events** page of the CS accessible from the **Hive Menu** button.



The left side of the events page shows a list of all the flights that have been performed with the system. All events are presented in chronological order from newest to oldest.

Note: The age of the events that are shown on the Events page can be limited with a setting by the administrator of the system.

By expanding the event on the left the details of the flight will be shown. On the left side, all main waypoints and pilot actions are shown as a list, including all the snapshots that were taken. On the right side, a map showing the entire flight path of the Bee during the flight will be presented.

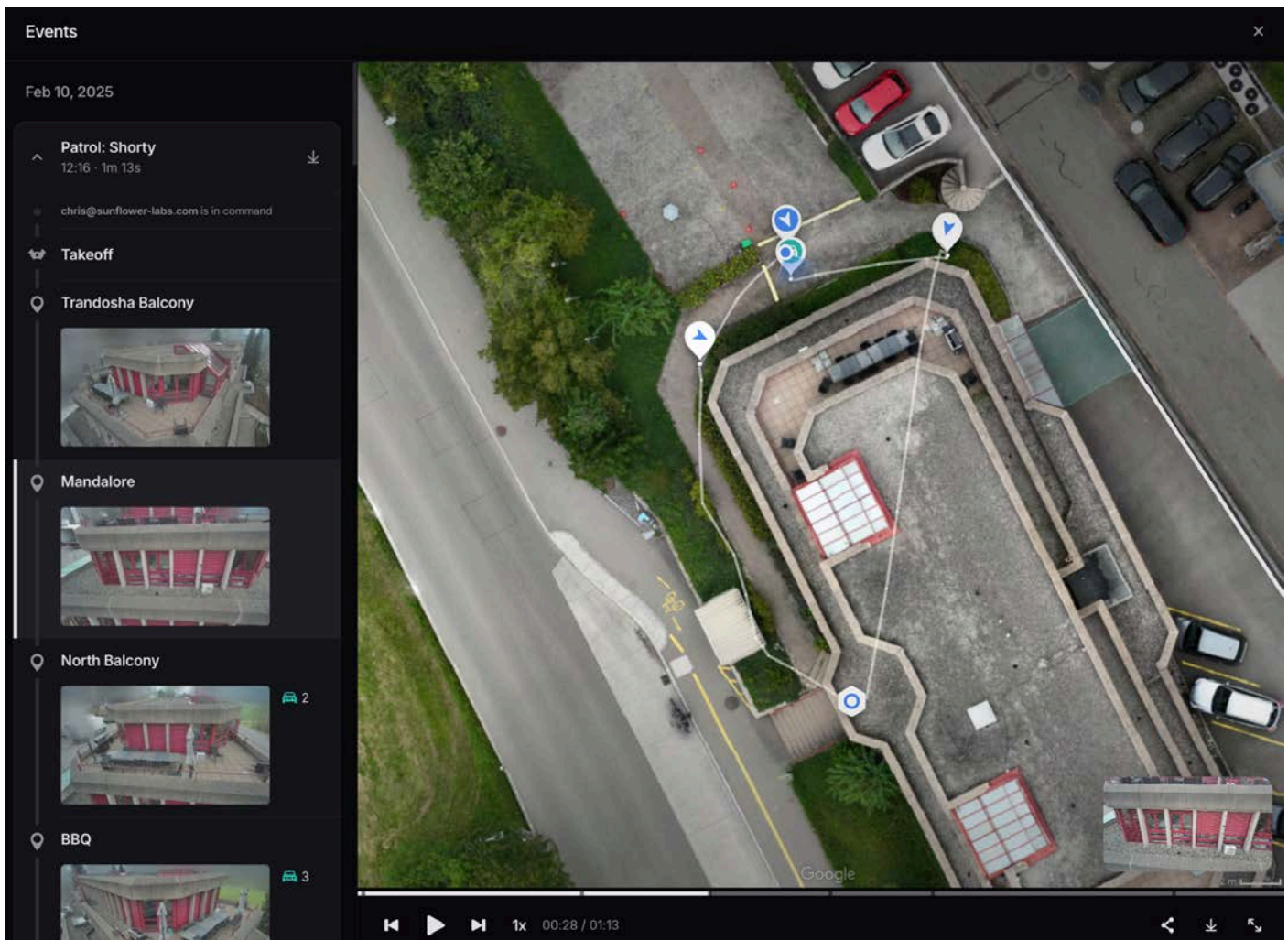


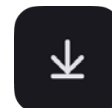
Figure 7-99 - Events View

Below the map of the flight path, the video controls for the recorded video are available.

The **Play** button will start the replay of the recorded video during the flight. When playing, the play button will be replaced by a **Pause** button. Using the **Skip Backward** and the **Skip Forward** buttons, one can jump backward or forward in the video to the next waypoint in the flight. The replay speed of the video can also be increased by clicking on the **1x** button.

While the video is playing, clicking on a waypoint in the list on the left or clicking on a waypoint in the map will advance the video playback to that spot in the video.

The video of the event can be downloaded by clicking the **Download** button in the bottom right corner.



Clicking on the **Play** button next to a waypoint in the list on the left will start replaying the video from that point on.

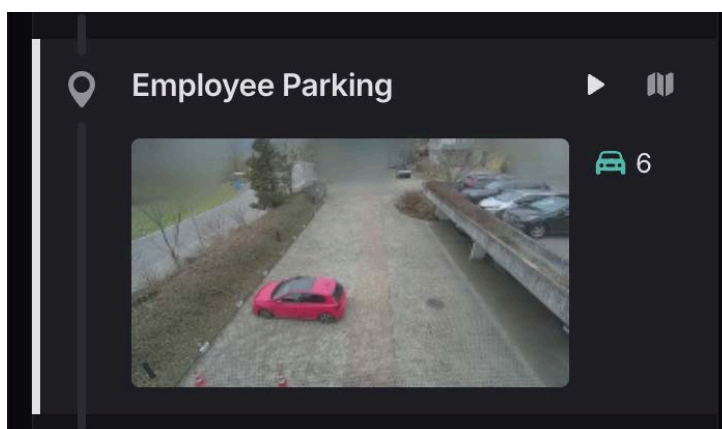


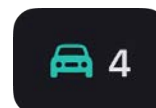
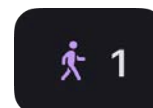
Figure 7-100 - Snapshot Preview

Clicking on the folded **Map** button next to a waypoint in the list on the left will show the map with the current waypoint active and the video advanced to the time the Bee was at that waypoint.



Clicking on a snapshot in the list on the left or in the map view will show the snapshot in the right window. If there were any people or vehicles detected in the snapshot, there will be an indication of how many people or vehicles were detected next to the snapshot on the left and also below the snapshot on the right.

Clicking on either the **People** or the **Vehicle** button below the snapshot on the right, will show where in the snapshot these detections were made.



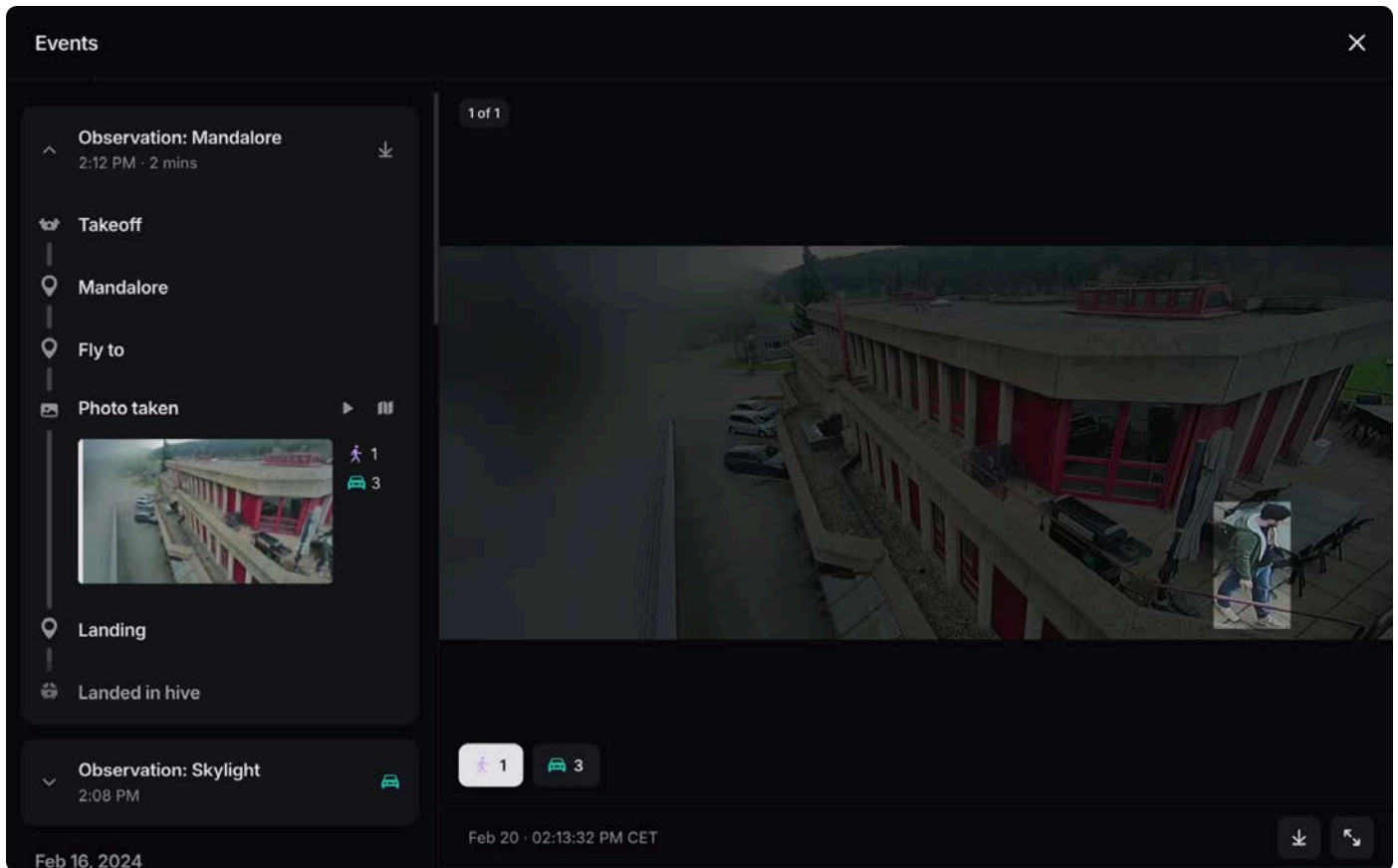


Figure 7-101 - Detection Indication

While a snapshot is showing, it can be downloaded by clicking the **Download** button.



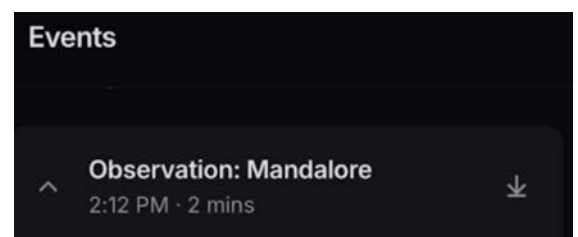
Any event can be viewed fullscreen by clicking on the **Fullscreen** icon.



A link to a particular event can be copied by clicking on the **Share** button.



By clicking on the **Download** button next to the event, the video and all snapshots taken during the event can be downloaded all at once.



7.11.3. Hive Controls

The following controls are related to the Hive operation.

7.11.3.1. Control Panel

The Hive control panel is mounted on one of the handle bars on the Hive.

The Hive control panel provides the buttons to command the Bee to land in the Hive, to land in place and to open and close the Hive roof. Refer to the [System Status](#) section for details.

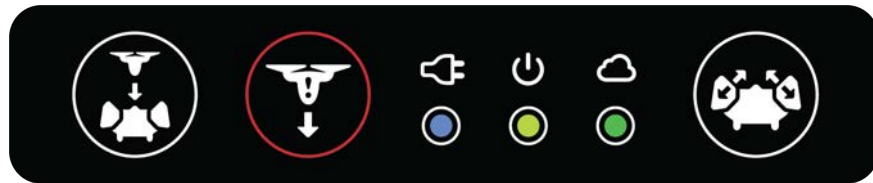


Figure 7-102 - Hive control panel

7.11.3.2. Hive Power and Subsystem Controls

The **Settings** → **Power & Controls** page in the **Hive Menu** provides controls for rebooting and shutting down the Hive and for controlling certain subsystems of the Hive.

Refer to section [Settings](#) for details.

7.12. System Integration and Automation

The Beehive system provides several integration and automation options.

Note: *Integration and automation options must be enabled and configured by a system administrator.*

7.12.1. System Integration

There are two ways of integrating the Beehive system with existing or external security infrastructure, either through triggers from external security sensors or through an API that allows external control of the system by 3rd party applications.

7.12.1.1. External Triggers

External triggers may come from external security sensors, such as gate triggers, motion sensors, fence sensors, security cameras, etc. An external trigger may be linked to an inspection of a specific location or a patrol of a specific route.

If one or more external triggers, that have been configured, fire, a popup will be shown in the top-right corner of the CS letting the remote pilot know which trigger had fired and a marker will be shown on the map that indicates which location or route will be flown to if the pilot decides to inspect the trigger event.

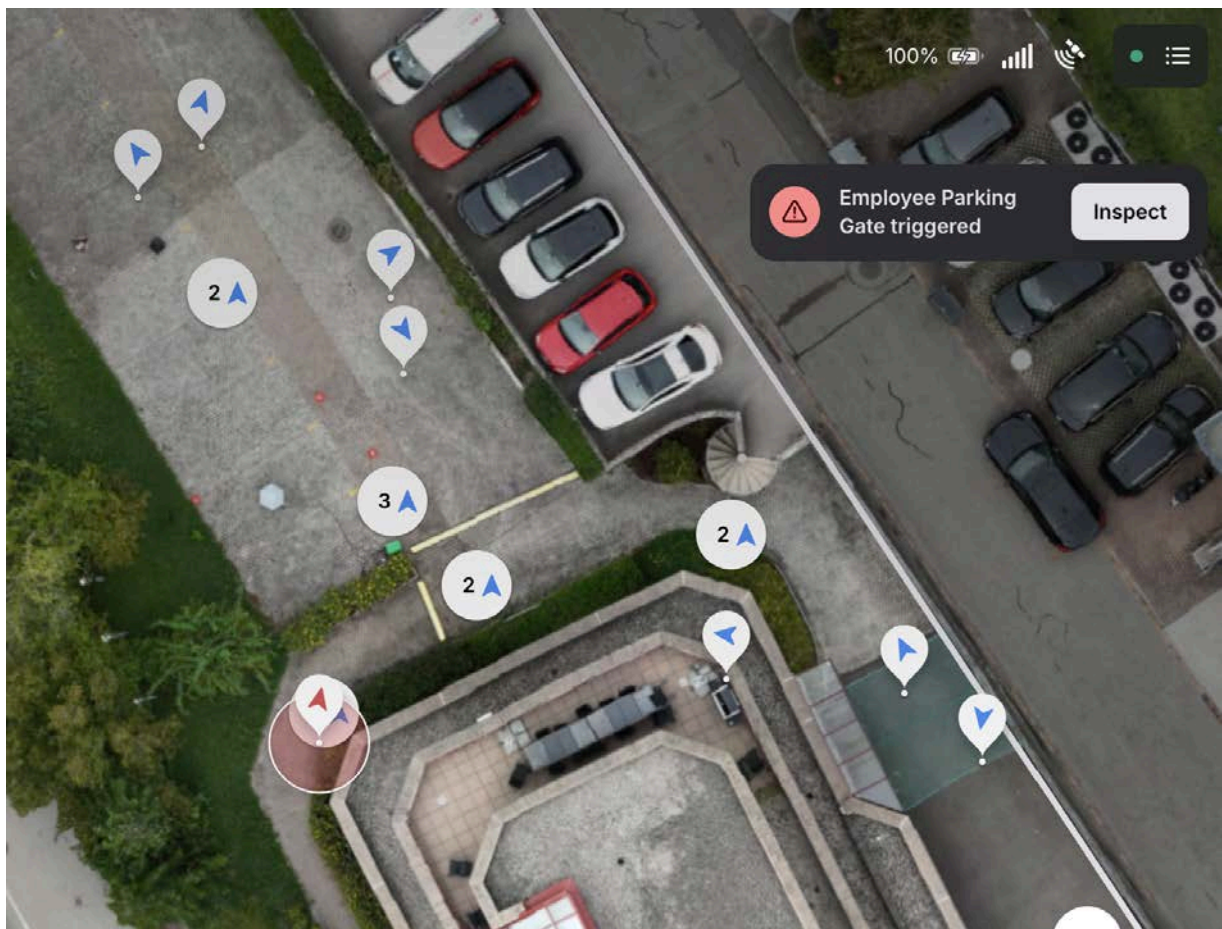


Figure 7-103 - Trigger Popup and Trigger Marker

The popup in the top-right will expire after 15 seconds. The indicator on the map will expire after the time that was configured for the trigger by the administrator.

If the trigger event should be inspected, click on the **Inspect** button in the popup dialog. If the popup has already expired and the event should be inspected, click on the trigger marker and click on the **Inspect** button.

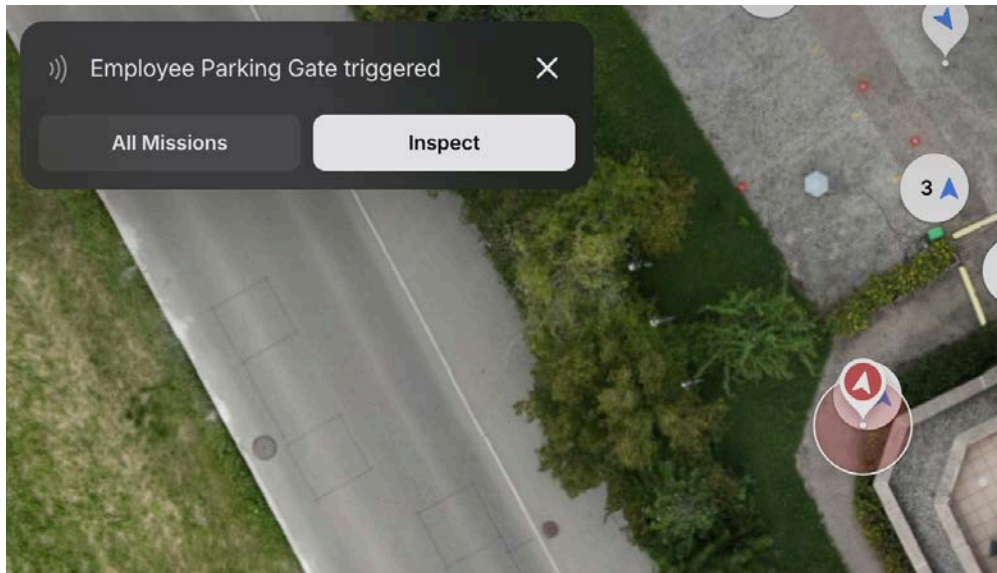


Figure 7-104 - Trigger Marker Inspect Window

If the external trigger is linked to a route, then the trigger popup will ask to **Patrol** the route and the first waypoint of the route will be shown on the map.

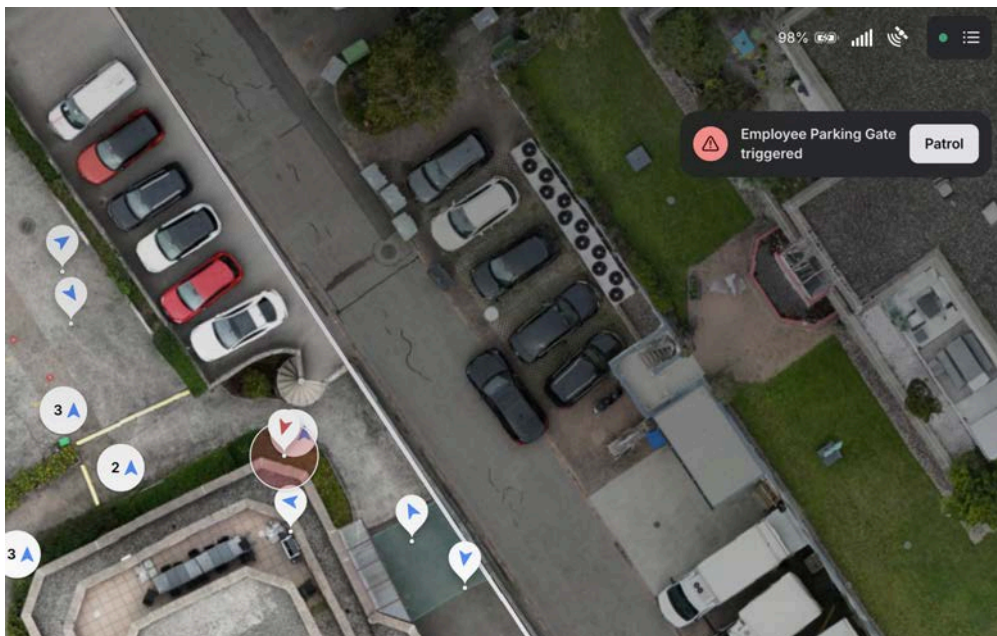


Figure 7-105 - External Trigger Patrol

7.12.1.2. External API

The external API allows an integrator to write a completely separate CS to control the Beehive system or, more importantly for this operations manual, to create triggers and flight requests that can be executed by the active remote pilot.

There are five ways that a call on the API might elicit a response from the pilot:

- Inspection Request
- Patrol Request
- Fly-to Request
- Follow Request
- Target Request

7.12.1.2.1. Inspection Request

If an API call requests the pilot to fly to a specific location, a popup will appear and the inspection location is highlighted on the map. The popup will say **Request to inspect <name> triggered**, where <name> is the name of the inspection location.

Click **Inspect** in the popup or click on the map location and then click **Inspect**.

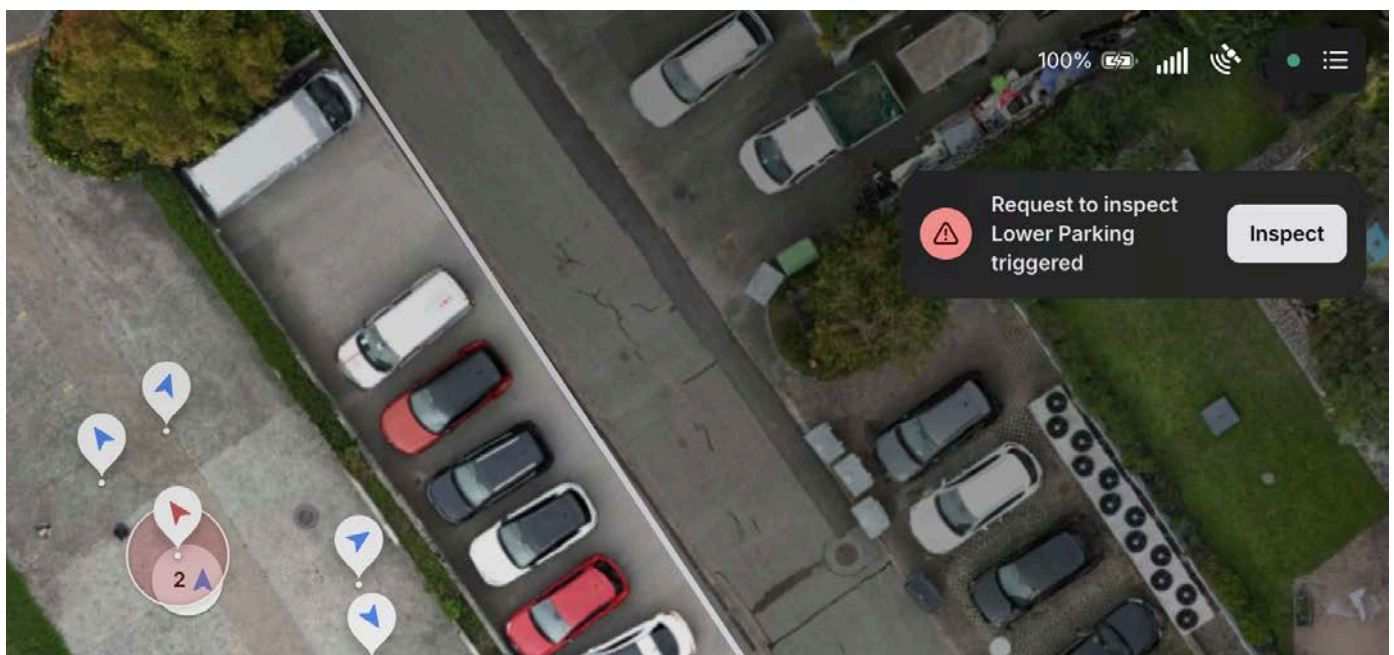


Figure 7-106 - Inspection Request Event

7.12.1.2.2. Patrol Request

If an API call requests the pilot to patrol a specific route, a popup will appear and the first waypoint on the route is highlighted on the map. The popup will say **Request to patrol <name> triggered**, where <name> is the name of the route that will be flown.

Click **Patrol** in the popup or click on the map location of the first waypoint and then click **Patrol**.

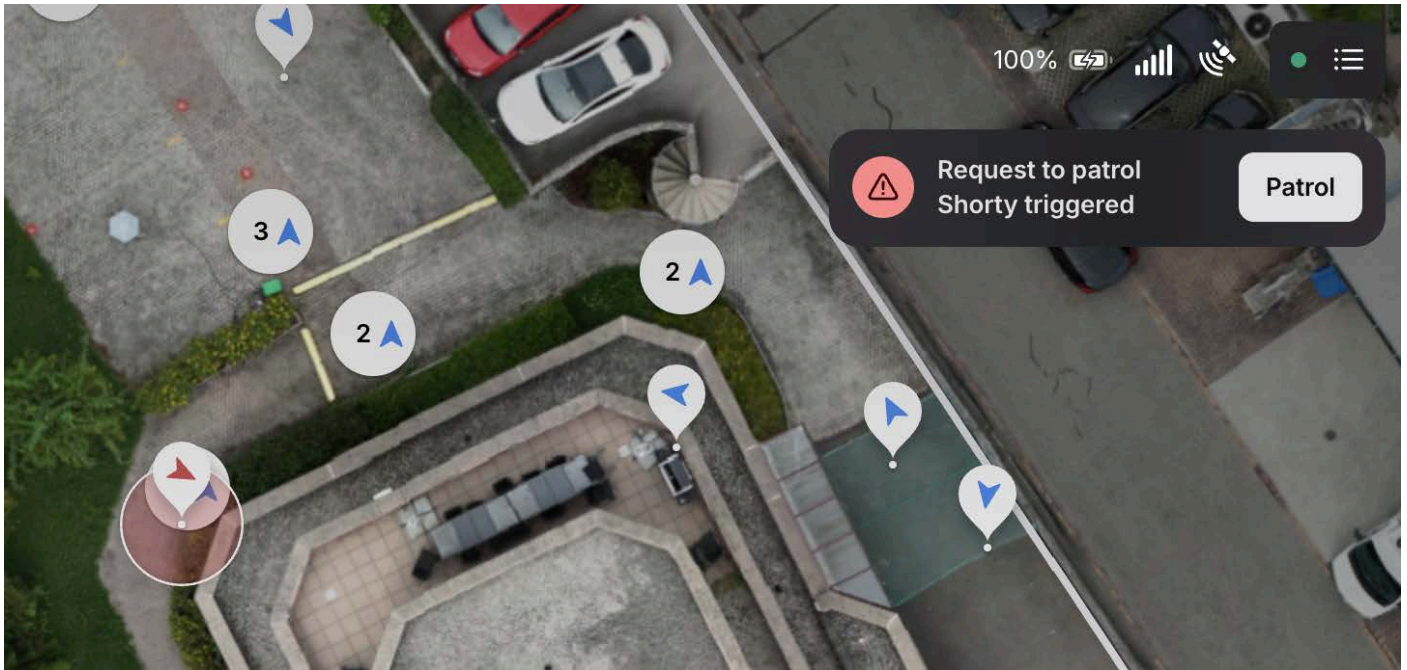


Figure 7-107 - Patrol Request Event

7.12.1.2.3. Fly to Request

If an API call requests the pilot to fly to a specific location, a popup will appear and the fly to point is highlighted on the map. The popup will say **Request to fly to <name> triggered**, where <name> is the name of the fly-to point in the API request.

Click **Fly to** in the popup or click on the map location of the first waypoint and then click **Fly to**.

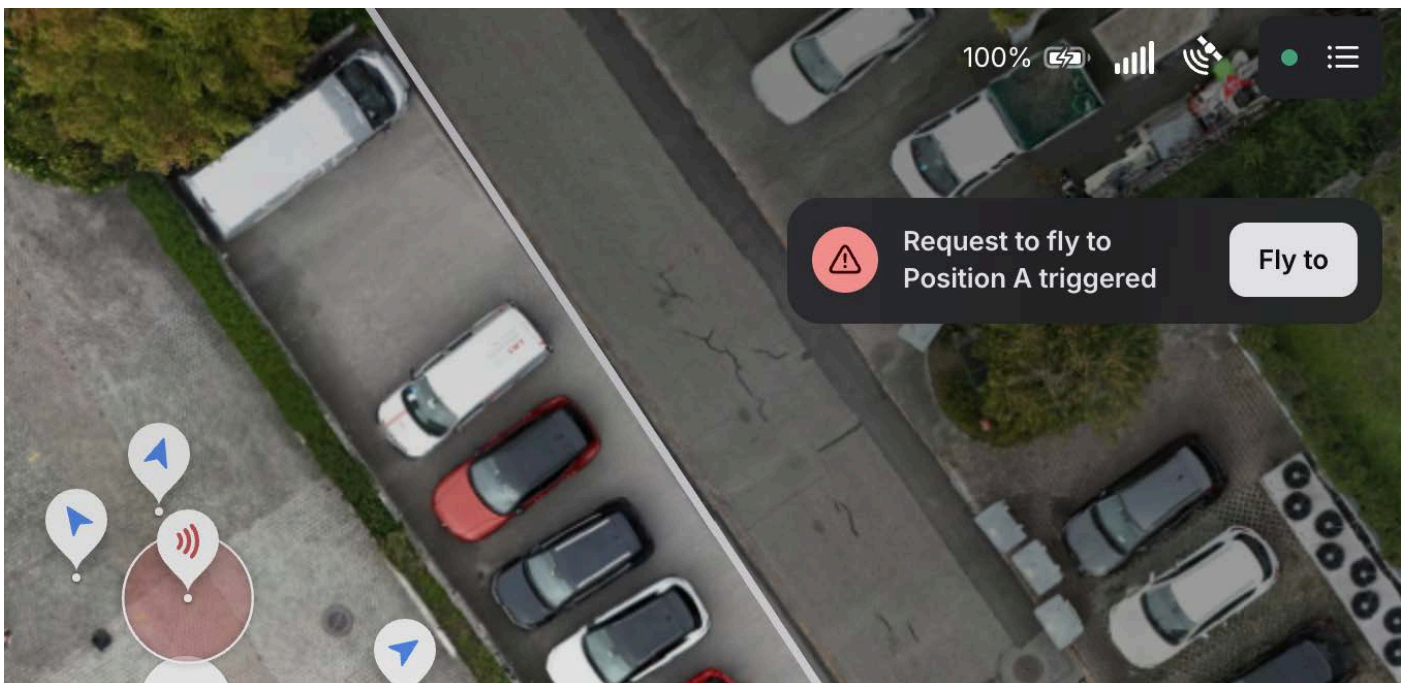


Figure 7-108 - Fly To Request Event

7.12.1.2.4. Follow Request

If an API call requests the pilot to follow to a specific target, a popup will appear and the target location is highlighted on the map. The popup will say **Target detected** and when expanded it will say **Request to follow <name>**, where <name> is the name of the target in the API request.

Expand the **Target detected** dialog, then click **Follow** in the popup or click on the map location of the target and then click **Follow**. If the target position is updated over the API, the Bee will keep following the new position.

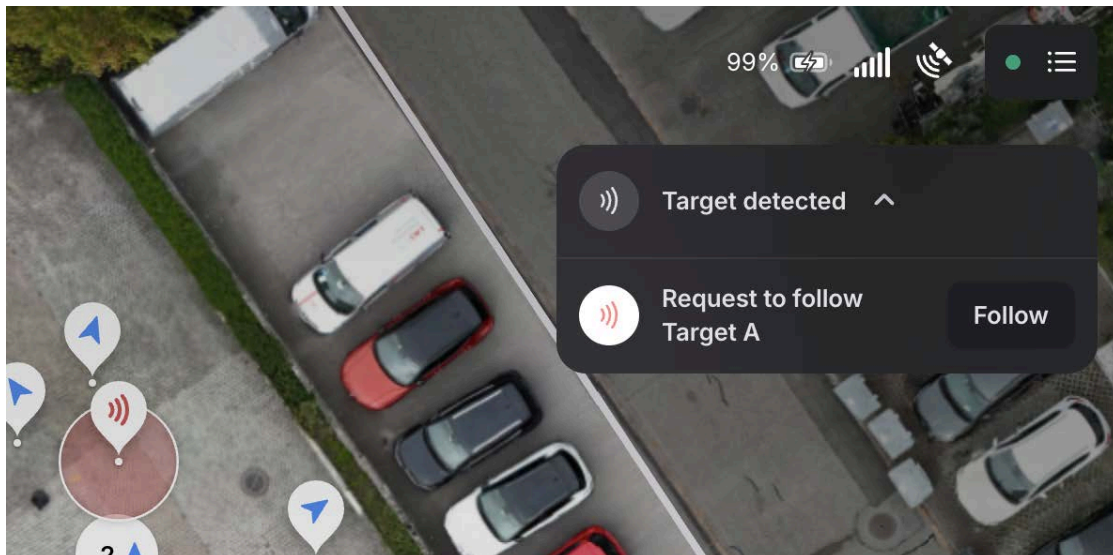


Figure 7-109 - Follow Request Event

7.12.1.2.5. Target Position

If an API call is received that informs the pilot of the detection of a target on the property, a popup will appear and the target location is highlighted on the map. The popup will say **Target detected** and when expanded it will say **<name>**, where <name> is the name of the target in the API request.

Expand the **Target detected** dialog, then click **Follow** in the popup or click on the map location of the target and then click **Follow**. If the target position is updated over the API, the Bee will keep following the new position.

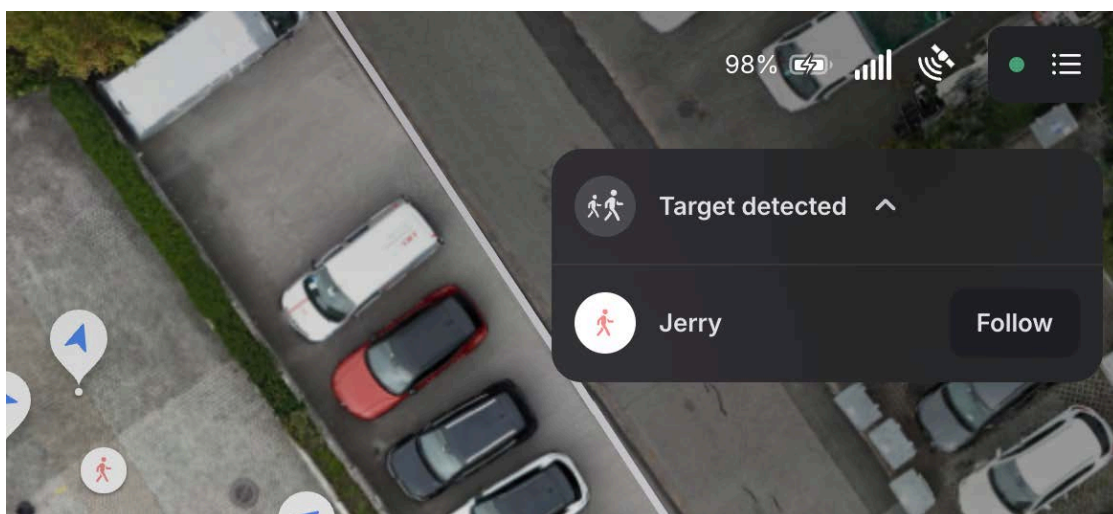
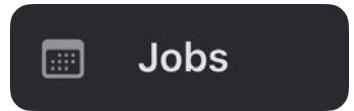


Figure 7-110 - Target Position Event

7.12.2. System Automation

The system provides a way to automate flights and set automatic reactions to external triggers. This feature is called Jobs and can be accessed from the **Hive Menu** button and then clicking on **Jobs**.



Note: Automated flights are only allowed and executed if an active remote pilot is present. The system actively checks for pilot presence. See section [Standby Pilot](#) below.

Note: The Jobs feature is optional and must be enabled by the system administrator in **Settings** → **Features**.

7.12.2.1. Configuring Jobs

All the scheduled jobs are shown on the **Jobs** page. The left side of the Jobs page shows the details of each job and the right side shows the jobs on either a timeline or a calendar.

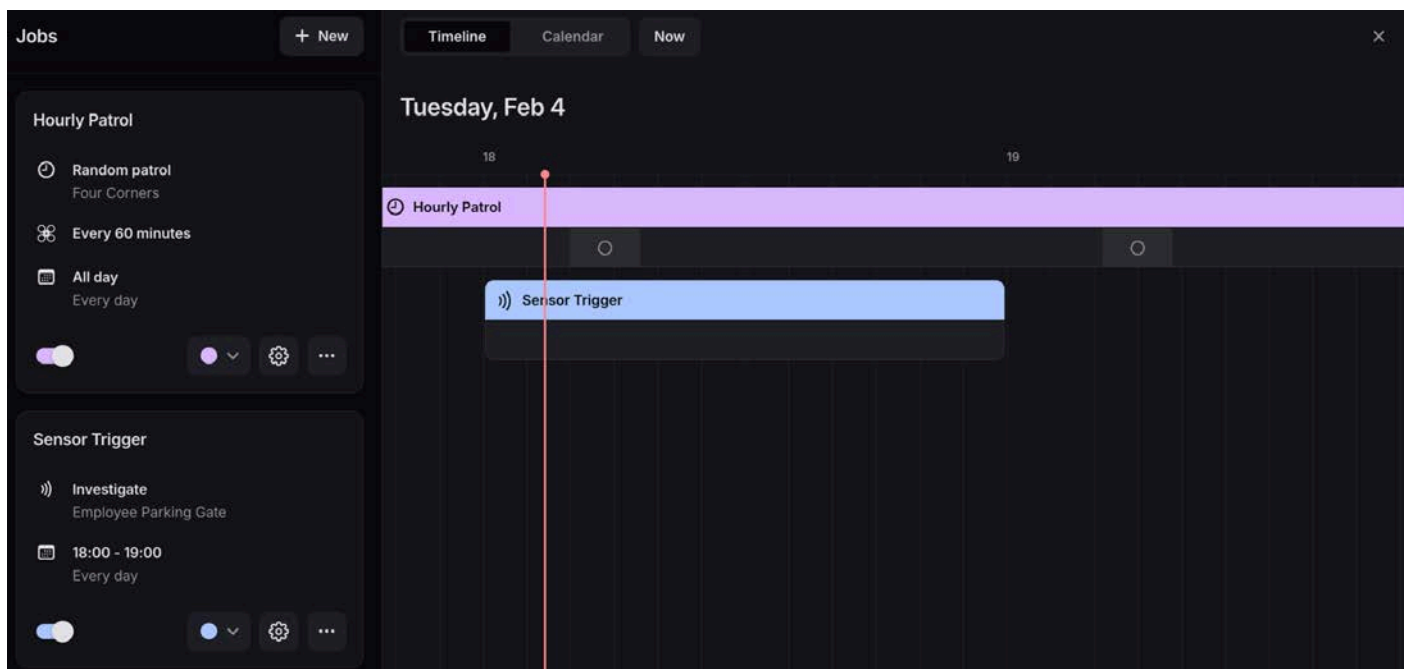
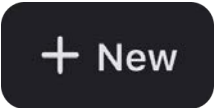


Figure 7-111 - Jobs Page

7.12.2.1.1. Scheduled Patrols

To schedule a new patrol, first click on the **New** button, then configure the patrol.



Name

e.g. Nightly patrol

Mode

Schedule a recurring patrol or investigate when a specific trigger is activated.

Patrol

Investigate

Choose a route or location

Schedule

Daily

Weekly

S

M

T

W

T

F

S

Operating hours

Define the active hours for each day

All day

From

18:15

to

19:15

One flight at

18:15

Interval between flights

30

minutes

Preferences

Randomize takeoff times

Randomly offset the timing of each flight by up to 15 minutes to reduce predictability.

Retry duration

The amount of time available to retry the flight before skipping the job.

15

minutes

Figure 7-112 - Scheduling Patrols

First, give the patrol a **Name**. Then select which **Color** should be used for the scheduled patrol in the timeline and the calendar.

For a patrol, the **Mode** should be toggled to Patrol. If it is not, click on **Patrol**. Scheduled Patrols are indicated with a clock icon.

A dark blue rounded rectangular button containing two toggle options: "Patrol" with a clock icon and "Investigate" with a double arrow icon.

Operations Manual
BH1-SYS-UOM / Rev. E

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Page 100 of 147

Next, select the **route or the location** that should be flown when the job is executed.

Choose a route or location

Test2 Route

Locations

Above net

Back Door

A job can either be executed **Daily** or **Weekly**. When **Weekly** is selected the job can be configured to be scheduled only on certain **Days** of the week.

Schedule

Daily

Weekly

S

M

T

W

T

F

S

Now select whether the job should be executed **All day** long, only in a given **time window**, or if only **one single flight** should be flown at a **specific time**.

Operating hours

Define the active hours for each day

All day

From

18:15

to

19:15

One flight at

18:15

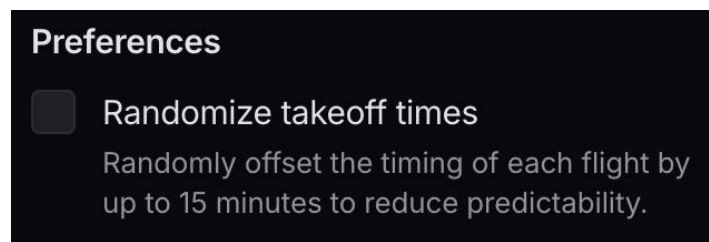
If more than one flight should be flown, then select the time **interval between flights**.

Interval between flights

30

minutes

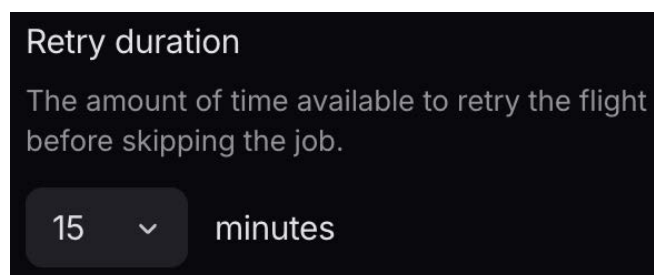
Takeoff times of scheduled patrols can be randomized in order to reduce the predictability of the time when flights are occurring. This will offset the takeoff time by some random amount of up to 15 minutes. Check **Randomize takeoff times** if this is desired.



The **Retry duration** specifies the time the system should retry a flight after it was scheduled before completely skipping the flight.

A flight of a job might not be able to execute at exactly its scheduled time because of several reasons:

- bad weather conditions,
- active flight advisories,
- air traffic in the area,
- system health issues,
- a manual flight is in progress, or
- because no standby pilot is logged in.



Note: The retry duration of a flight should be less than the scheduled interval between flights. If randomized takeoff times are selected, the retry duration should be less than the interval between scheduled flights minus 30 minutes.

After completing the configuration of the scheduled flight, click **Save**.

The job details are now shown on the left and the jobs overview is visible in the timeline.

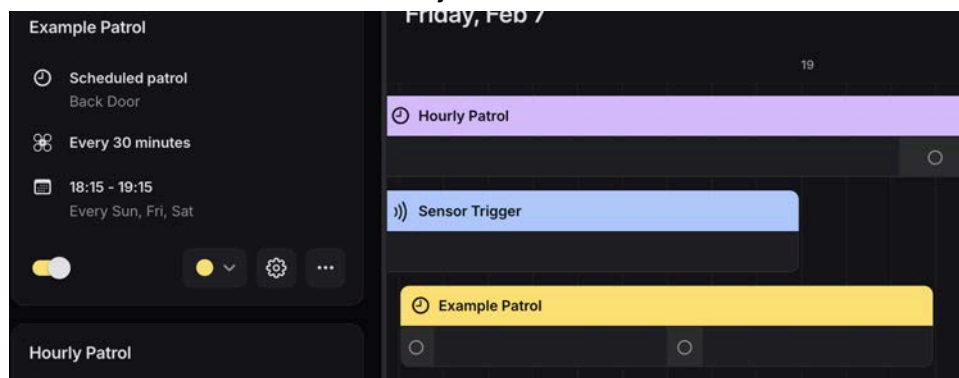
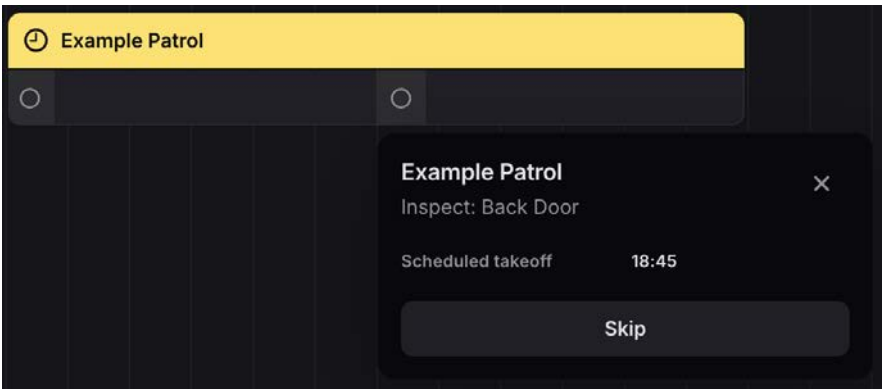


Figure 7-113 - Jobs Timeline

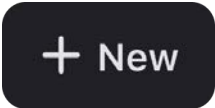
The circles below the job timeline indicate when the flights in the job are scheduled. Clicking on the circle will reveal a popup dialog indicating the exact flight details.



7.12.2.1.2. Trigger Investigation

Note: A trigger investigation job can only be configured with a trigger that has already been configured. Triggers can only be configured by the system administrator.

To schedule a new trigger investigation, first click on the **New** button, then configure the investigation.

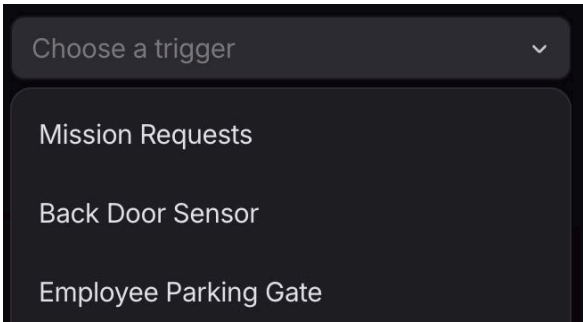


First, give the investigation a **Name**. Then select which **Color** should be used for the investigation in the timeline and the calendar.

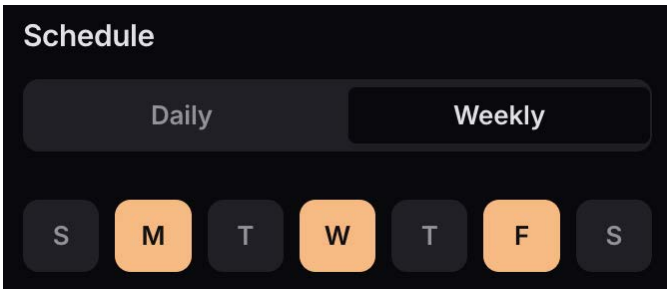
For an investigation, the **Mode** should be toggled to Investigate. If it is not, click on **Investigate**. Trigger investigations are indicated with a sensor icon.



Next, select the **trigger** that should trigger the investigation.



A trigger investigation can either be executed **Daily** or **Weekly**. When **Weekly** is selected the trigger can be configured to be scheduled only on certain **Days** of the week.



Now select whether the automatic trigger investigation should be executed **All day** long or only in a given **time window**.

Operating hours

Define the active hours for each day

All day

From

20:00

to

6:00

Next day

The **Retry duration** specifies the time the system should retry a flight after it was scheduled before completely skipping the flight. A flight might not be able to execute at exactly its scheduled time because of several reasons:

- bad weather conditions,
- active flight advisories,
- air traffic in the area,
- system health issues,
- a manual flight is in progress, or
- because no standby pilot is logged in.

Retry duration

The amount of time available to retry the flight before skipping the job.

15

▼

minutes

After completing the configuration of the scheduled flight, click **Save**.

The job details are now shown on the left and the jobs overview is visible in the timeline.

Back Door Sensor Night

Investigate

Back Door Sensor

20:00 - 6:00 (next day)

Every Mon, Wed, Fri

Friday, Feb 7

20

21

Hourly Patrol

Back Door Sensor Night

Operations Manual
BH1-SYS-UOM / Rev. E

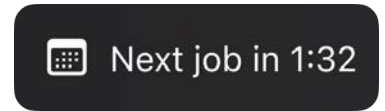
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Page 104 of 147

7.12.2.2. Active Jobs

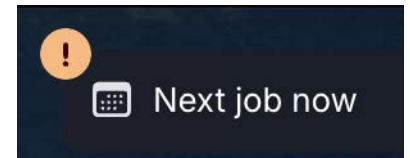
If there are any active and enabled jobs, the system information bar will show a calendar icon to the right of the Bee status icons.



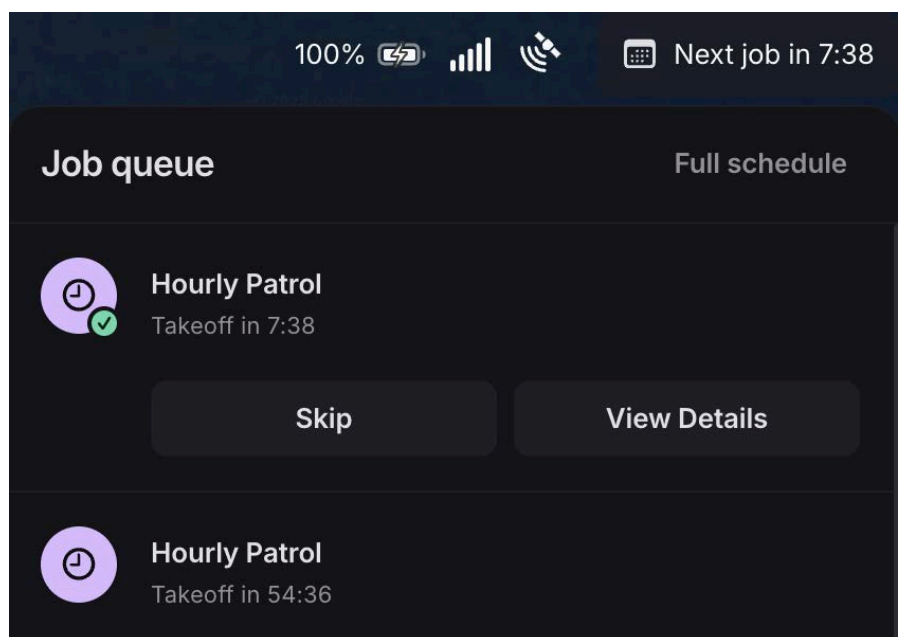
10 minutes before a job is due, the CS will start a countdown until the takeoff is scheduled.



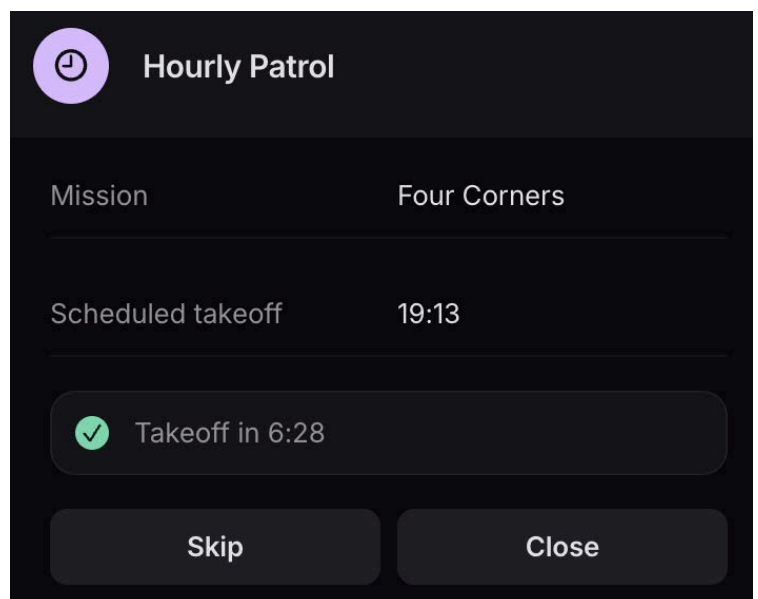
If a job can't be executed because of weather, flight advisories, a missing standby pilot, etc., the calendar icon will show an amber exclamation mark next to the job indicator in order to let a pilot know that a job is either coming up soon or is already due and can't be executed.



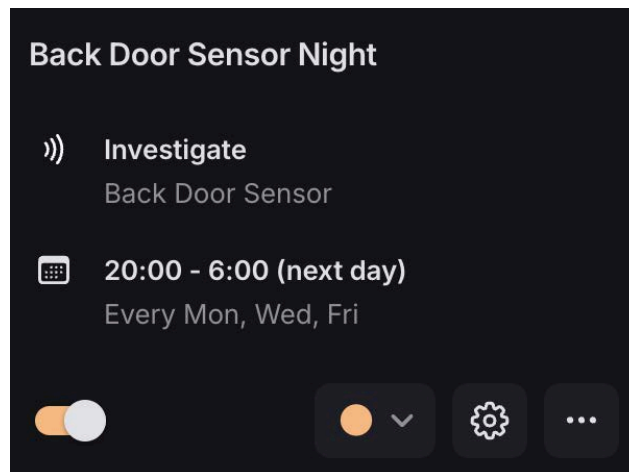
Clicking on the **calendar icon** will reveal the current job queue.



Clicking on **View Detail** next in the job queue will reveal the details of the job.

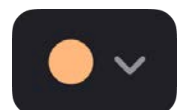


7.12.2.3. Disabling Jobs



The toggle button in the lower left corner of the jobs detail view can be used to enable or disable a specific job on demand. Disabling a job does not delete it and it can be reenabled at any time. The job timeline will reflect this setting immediately.

The job **color** can be changed from the color dropdown in the detail view.



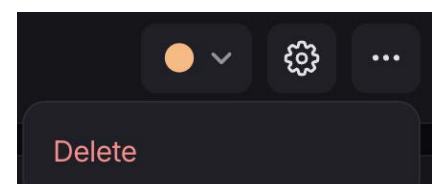
7.12.2.4. Editing Jobs

A job can be **configured** by clicking on the configure icon in the detail view.



7.12.2.5. Deleting Jobs

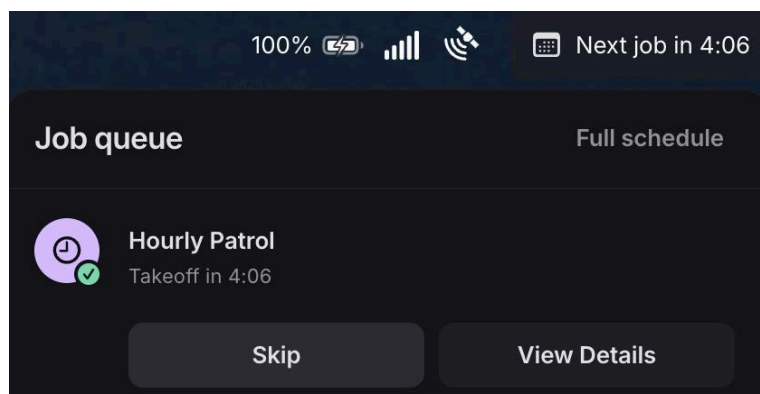
A job can be permanently **deleted** by expanding the menu icon in the detail view and selecting Delete. The permanent deletion of a job must be confirmed.



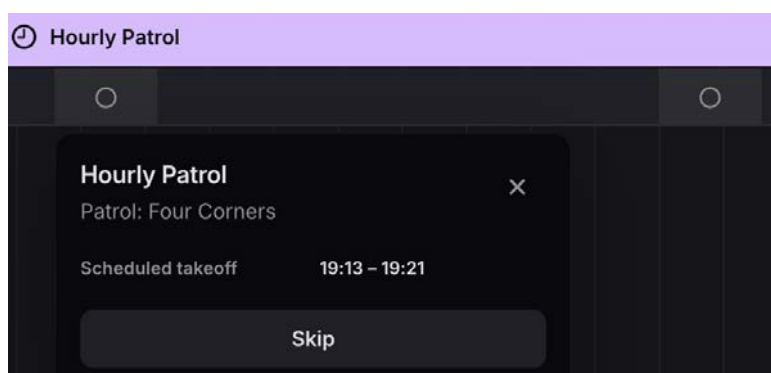
7.12.2.6. Skipping Jobs

It is possible to skip specific jobs in the jobs queue.

Jobs can be skipped by clicking on the calendar icon, then selecting the job in the queue, and then clicking **Skip**. A skipped job can also be unskipped by clicking **Unskip**.



Jobs can also be skipped by going to the jobs page, then selecting the specific job in the timeline (the circle below the line), and then clicking **Skip**. A skipped job can also be unskipped by clicking **Unskip**.



7.12.2.7. Standby Pilot

The execution of jobs requires an active remote pilot that is logged in as a standby pilot.

If no pilot is logged in as standby pilot and a job is scheduled, an exclamation mark will appear above the jobs scheduler. This is to inform any other pilot logged into the CS that a job is scheduled but no standby pilot is signed in.



Figure 7-114 - Jobs Information

Note: If a pilot is logged in as a standby pilot and closes the CS, the screensaver starts, or the pilot loses the internet connection, the pilot will automatically be logged out as standby pilot.

7.13. Direct Remote Identification

7.13.1. General

Direct Remote Identification (DRID) refers to the Bee's capability to be identified during the whole duration of the flight, in real time and with no specific connectivity or ground infrastructure link, by existing mobile devices when within the broadcasting range.

The Beehive 1 Bee continuously broadcasts remote ID data using **Bluetooth 4 Legacy Advertising** and **Bluetooth 5 Long Range** methods.

7.13.2. Upload of UAS Operator Registration Number - Europe Only

For the upload of UAS operator registration number, follow the steps in the installation manual [\[Ref. 1\]](#).

7.13.3. Upload of UA Registration Number - United States and Japan Only

For the upload of UA registration number, follow the steps in the installation manual [\[Ref. 1\]](#).

7.13.4. Pilot Location

Pilot location refers to the geographic location of the RPIC. The pilot position mode must be selected according to the federal and local requirements at the location where the Beehive 1 system is installed.

The pilot position can be configured in **Settings** → **Remote ID**. Refer to [Set Pilot Position](#) for instructions.

7.14. Privacy Blurring

The system contains a privacy blurring feature that, if enabled by the administrator, will blur any area in the videos and snapshots that lie outside the geocage. This privacy blurring, if enabled, will also blur the live video in real time.



Figure 7-115 - Example snapshot with privacy blurring

7.15. Settings

The Settings page for the Pilot contains tabs for Power & Controls, Remote ID, and Maintenance. Click on the **Hive Menu** button, then select **Settings**.

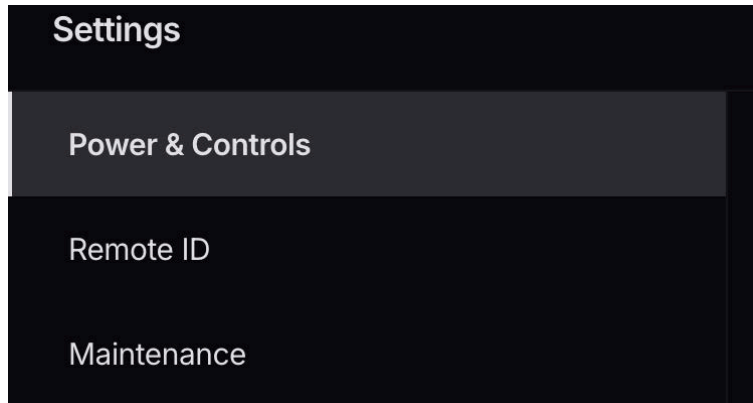
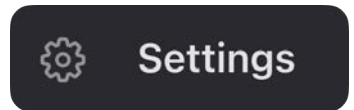


Figure 7-116 - Pilot Settings

7.15.1. Power & Controls

The Power & Controls tab provides buttons to control the power on the system and to control certain aspects of the Hive and the Bee.

7.15.1.1. Power

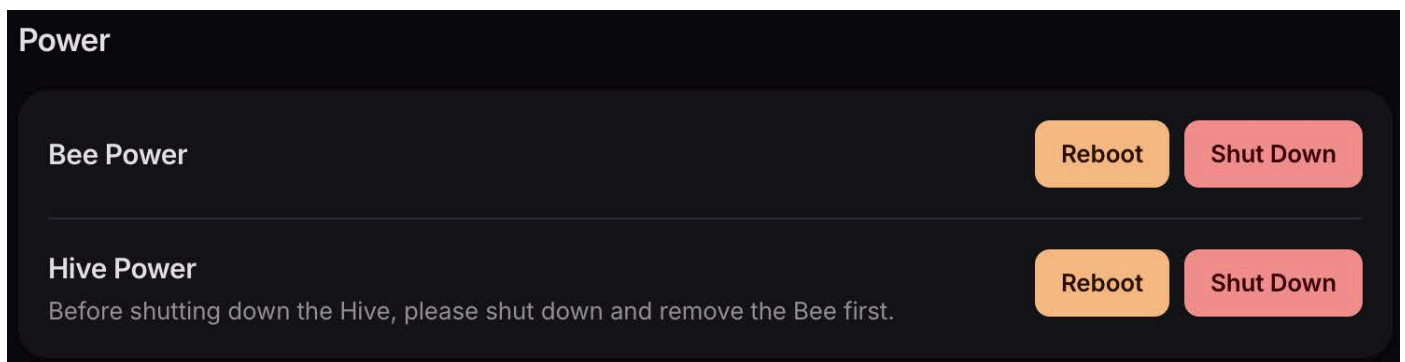


Figure 7-117 - Power Controls

The **Bee Power** controls allow the user to either Reboot or Shut Down the Bee.

During a reboot the Bee will turn off and automatically start back up. During a shut down the Bee will completely turn off and won't turn back on.

Note: To turn on the Bee after a complete shut down, toggle the charging rings off (if they are not already off) and back on again (see below).

The **Hive Power** controls allow the user to either Reboot or Shut Down the Hive.

During a reboot the Hive will turn off and automatically start back up. This can take several minutes. During a shut down the Hive will completely turn off and won't turn back on again.

Warning: Once the Hive has been shut down completely, it is not possible to power the Hive back on remotely. The only way to turn the Hive back on is to completely remove the power from the Hive, push the button on the Hive electronics box to temporarily remove backup power, and reconnect power to the Hive. Refer to the installation manual [\[Ref. 1\]](#) for details.

7.15.1.2. Hive Controls

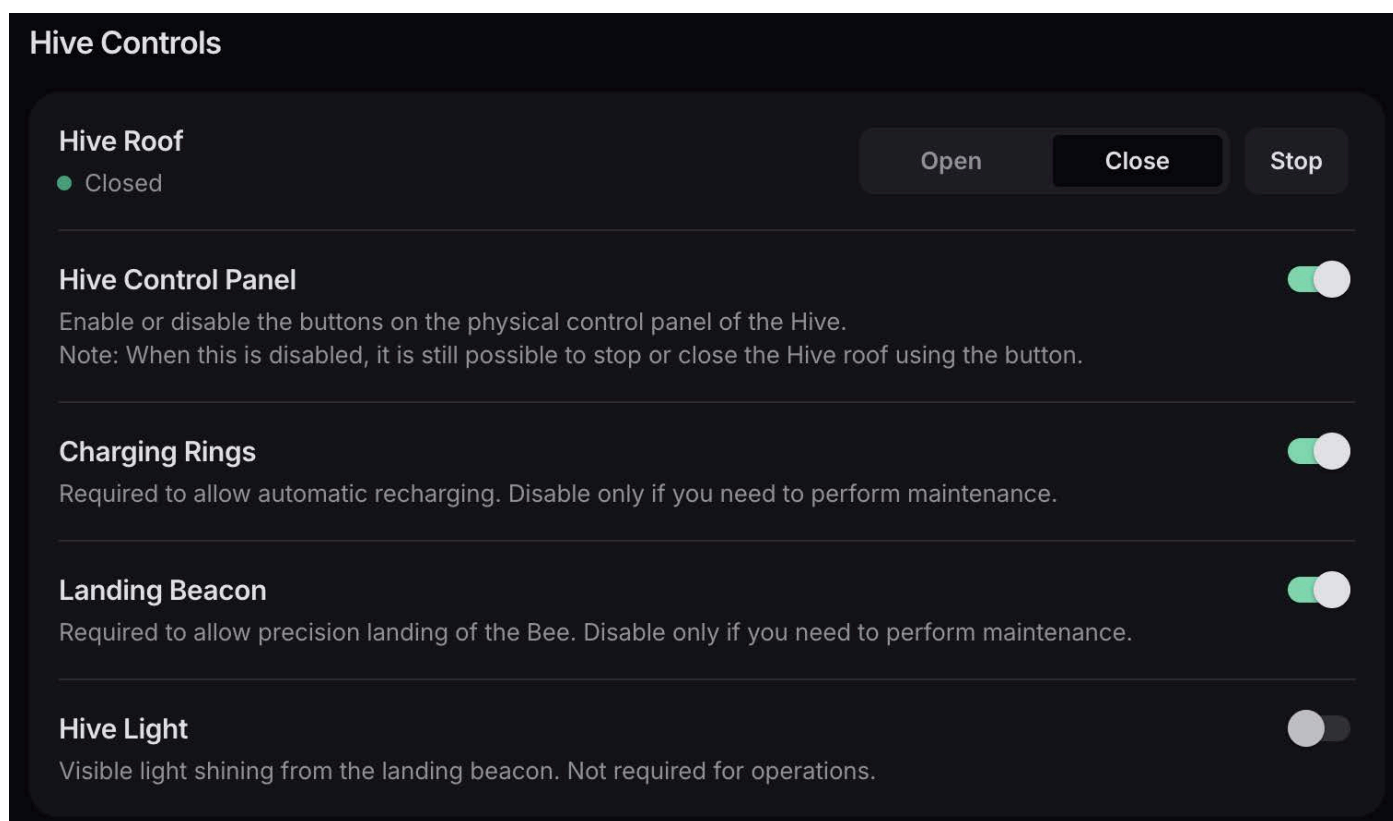


Figure 7-118 - Hive Controls

The **Hive Roof** controls allow the user to **Open** or **Close** the roof of the Hive or to **Stop** the roof while it is in motion.

Note: The Hive roof must be closed before the system allows the pilot to fly.

The **Hive Control Panel** controls allow the user to enable or disable the physical control panel on the Hive. Disabling the control panel will prevent somebody close to the Hive from opening the roof or interfering with an ongoing flight.

Note: For safety reasons, disabling the Hive Control Panel does not disable the Stop and Close buttons on the physical control panel.

The **Charging Rings** option allows the user to turn off the power to the charging rings in the Hive. This should only ever be necessary before removing the Bee from the Hive or putting the Bee into the Hive.

Note: *If the charging rings are left off, the Bee will not charge and eventually shut itself down.*

The **Landing Beacon** control allows the user to turn off the landing beacon in the Hive. This should not be necessary unless performing maintenance on the system.

Note: *The landing beacon must be on before the pilot is allowed to fly.*

The **Hive Light** option allows the user to turn on and off the visible light coming from the landing beacon. This light is not required for operations.

7.15.1.3. Bee Controls

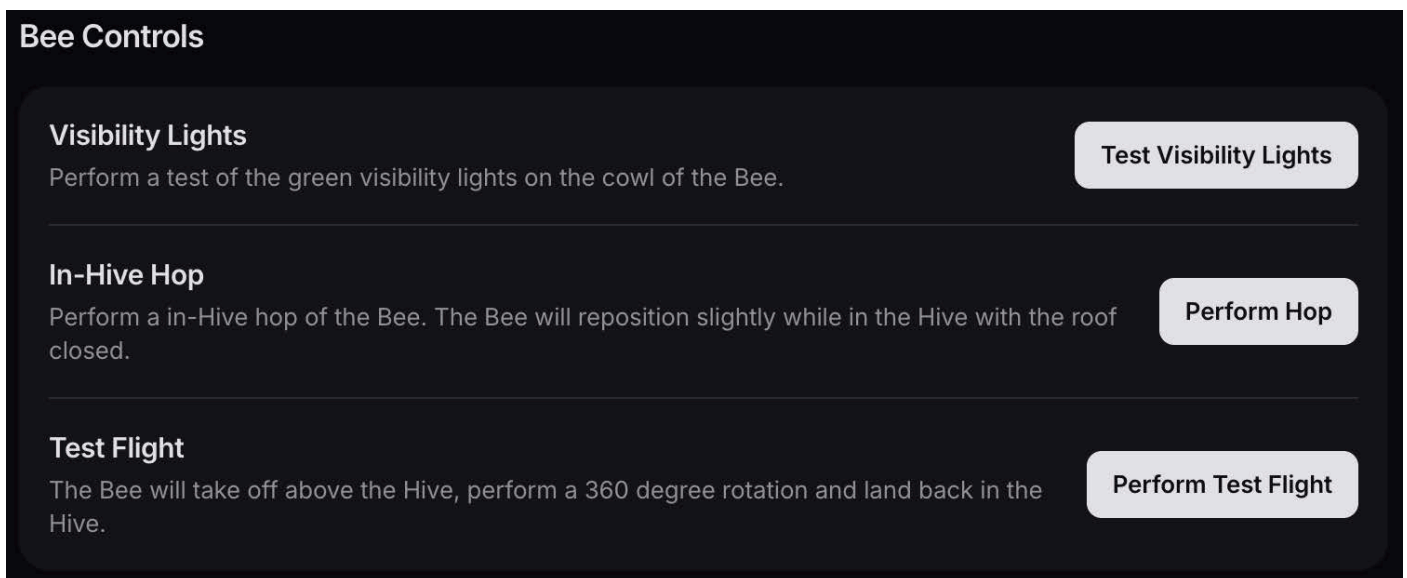


Figure 7-119 - Bee Controls

The **Test Visibility Lights** control allows the system administrator to run a check on the green visibility (conspicuity) lights on the cowl of the Bee. When this button is pushed, the visibility light will blink for 20 seconds.

The **In-Hive Hop** control allows the administrator to tell the Bee to perform a hop inside of the Hive with the roof closed and realign the charging contacts on the charging rings. This action may be performed when the Bee does not have a proper charging contact with the charging rings and is not charging.

The **Test Flight** controls allow the user to perform a short test flight (operational checkout flight) above the Hive. During this flight, the Bee will climb some distance above the Hive and rotate 360 degrees, then land again.

7.15.2. Remote ID

The Remote ID tab shows the current status of the remote ID module in the Bee and the current status of the pilot position that is transmitted by the direct remote ID module.

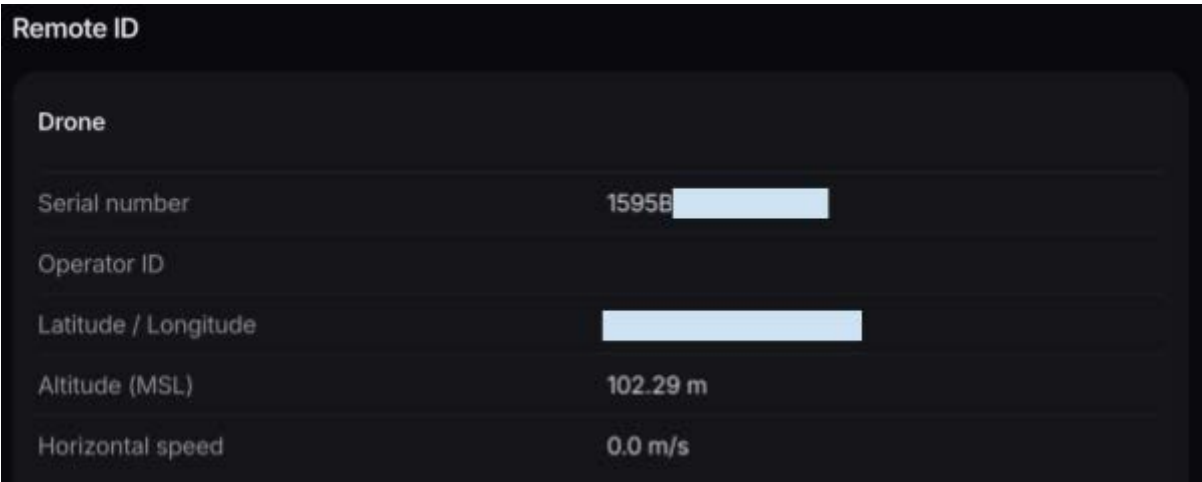


Figure 7-120 - Remote ID Status

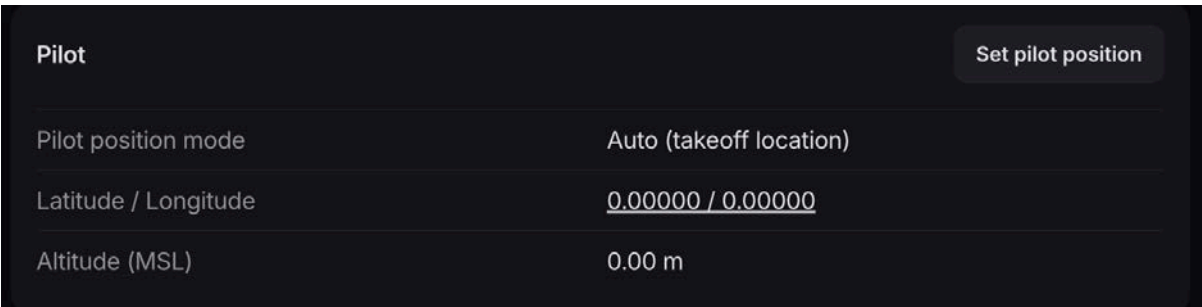
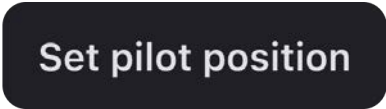


Figure 7-121 - Pilot Position

The pilot position configuration can be changed by clicking the Set pilot position button.



7.15.2.1. Set Pilot Position

The pilot position can be set to the takeoff location, the dynamic position of the device controlling the UAS, or a fixed position.

7.15.2.1.1. Takeoff Location

Select this option by clicking on **Auto** and then choosing **Takeoff location** from the dropdown.

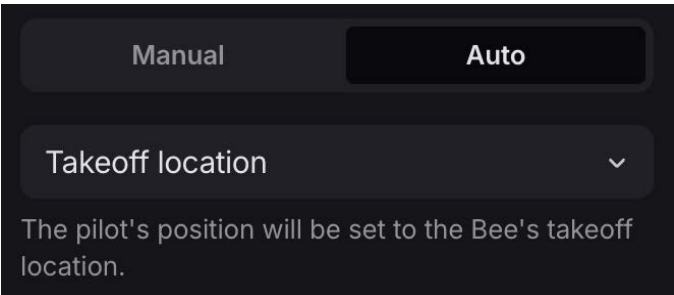


Figure 7-122 Pilot Location - Take-Off Option

The pilot location is automatically set to the geographical position of the take-off point, i.e., the location of the Hive.

7.15.2.1.2. Dynamic

Select this option by clicking on **Auto** and then choosing **Device's current location** from the dropdown.

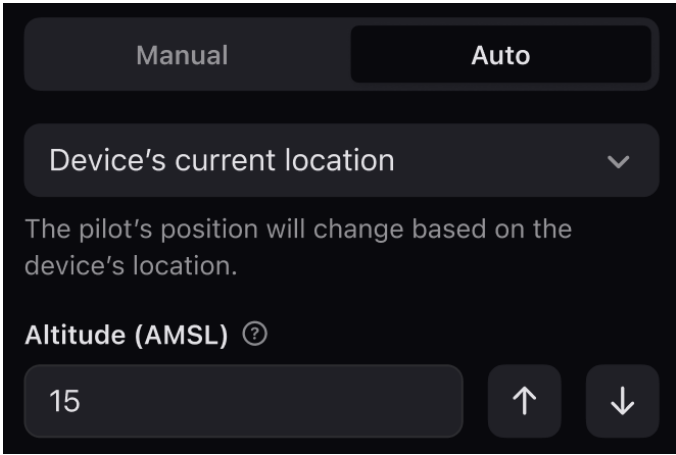


Figure 7-123 Pilot Location - Dynamic Option

The pilot location is set to the current location information of the CS as acquired from a dynamic location source (e.g. GNSS) connected to the Hive device. If the device does not provide an altitude, the altitude must be entered manually.

7.15.2.1.3. Manual (Fixed)

Select this option by clicking on **Manual** and entering the latitude, longitude, and altitude of the pilot manually.

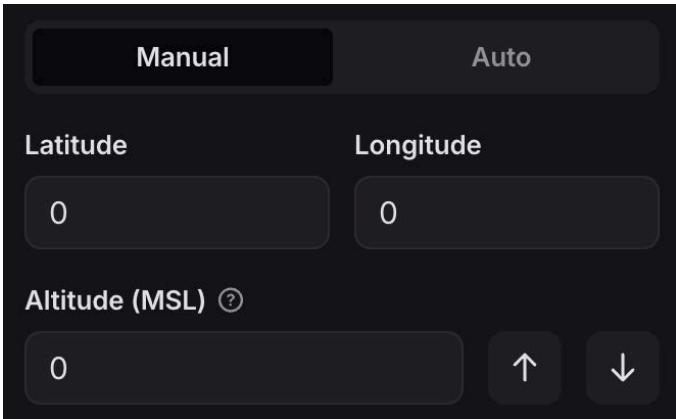
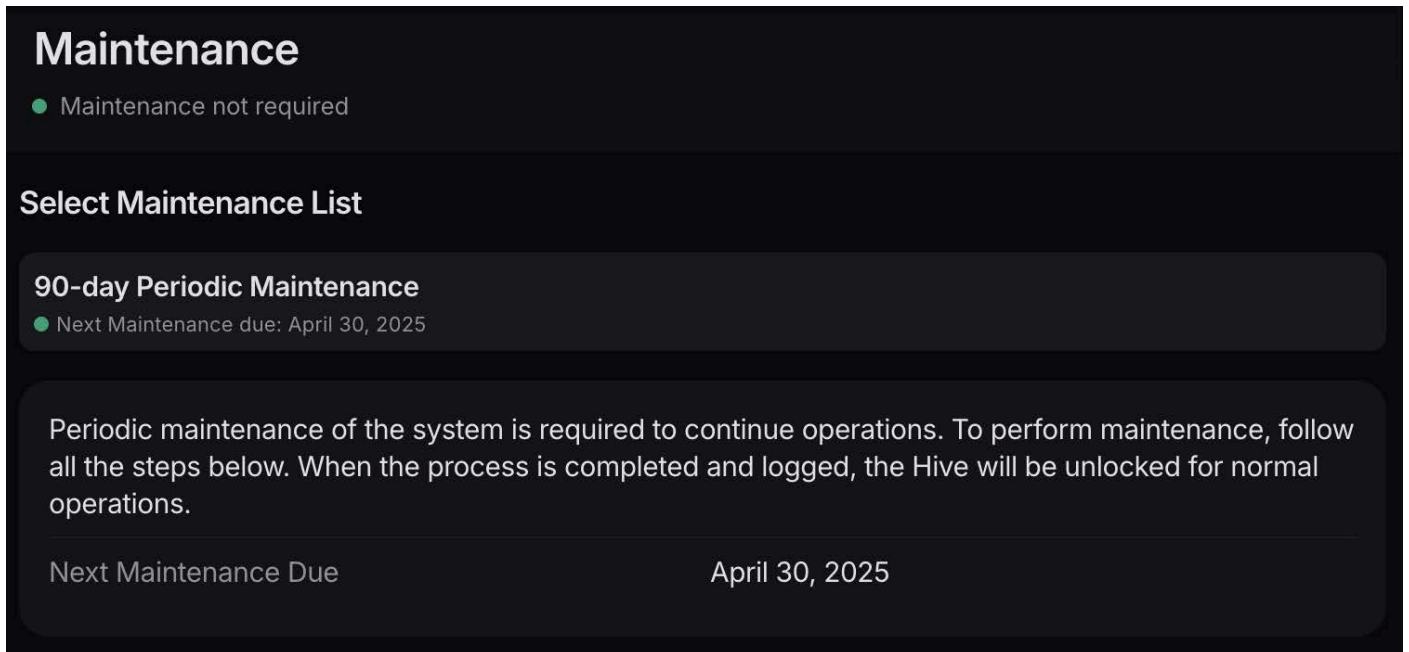


Figure 7-124 Pilot Location - Fixed Option

The pilot location information is manually entered by the RPIC.

7.15.3. Maintenance

The Maintenance tab shows the current status of the UAS maintenance and indicates when the next scheduled maintenance will be due.



The screenshot displays the 'Maintenance' section of a user interface. At the top, the title 'Maintenance' is shown in a large, bold font. Below it, a green dot indicates 'Maintenance not required'. A section titled 'Select Maintenance List' contains a card for '90-day Periodic Maintenance'. This card shows a green dot and the text 'Next Maintenance due: April 30, 2025'. Below the card, a paragraph explains that periodic maintenance is required to continue operations and provides instructions on how to perform it. At the bottom, a table-like structure shows 'Next Maintenance Due' as 'April 30, 2025'.

Maintenance

● Maintenance not required

Select Maintenance List

90-day Periodic Maintenance

● Next Maintenance due: April 30, 2025

Periodic maintenance of the system is required to continue operations. To perform maintenance, follow all the steps below. When the process is completed and logged, the Hive will be unlocked for normal operations.

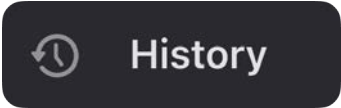
Next Maintenance Due	April 30, 2025
----------------------	----------------

Figure 7-125 -System Maintenance Tab

The maintenance tab also contains the maintenance checklist that is needed to complete the scheduled maintenance. Refer to the maintenance manual [\[Ref. 2\]](#) if the maintenance on your UAS needs to be performed and you are qualified to perform the maintenance. Otherwise, contact your maintenance personnel.

7.16. History

The History tab in the Settings provides the complete command history of the UAS.



History

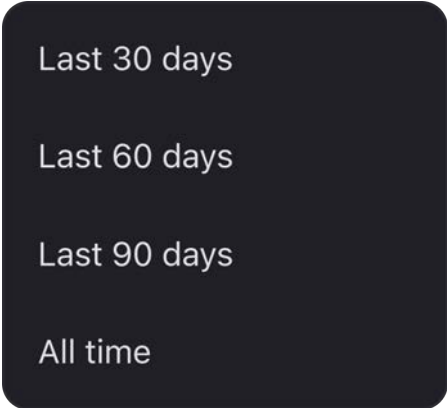
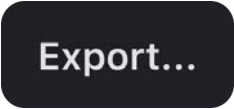
Export... X

Q Search

Command	User	Date & time
Land in Hive	Joe Pilot	2024-05-31 18:59:00 CET
Inspect: temporary marker	Joe Pilot	2024-05-31 18:59:00 CET
Inspect: Office back entrance	Joe Pilot	2024-05-31 18:59:00 CET
Launch	Joe Pilot	2024-05-31 18:59:00 CET
Land in Hive	Jane Pilot	2024-05-31 18:59:00 CET
Inspect: temporary marker	Jane Pilot	2024-05-31 18:59:00 CET
Inspect: temporary marker	Jane Pilot	2024-05-31 18:59:00 CET
Inspect: temporary marker	Jane Pilot	2024-05-31 18:59:00 CET
Inspect: temporary marker	Jane Pilot	2024-05-31 18:59:00 CET
Launch	Jane Pilot	2024-05-31 18:59:00 CET
Inspect: temporary marker	Jane Pilot	2024-05-31 18:59:00 CET
Land in Hive	Joe Pilot	2024-05-31 18:59:00 CET
Inspect: temporary marker	Joe Pilot	2024-05-31 18:59:00 CET

Figure 7-126 - Command History

The history can be downloaded in CSV format. Click on Export and then select how far back you want to export the history.



8. Troubleshooting

This section describes the meanings of Bee errors and failures that might occur, and also provides instructions for solving the underlying issues.

Errors and failures that might show up are split into 3 categories:

- 1) Alerts
- 2) Bee state failures
- 3) Mission execution failures

If more than one error or failure is detected, the pilot should attempt to solve the problems in the order given above.

8.1. Alerts

8.1.1. Emergency Alerts

Air Traffic

Indication	Condition	Remedy
Air Traffic Critical	There is air traffic in the red traffic cylinder.	Wait for the air traffic to leave. If in flight, the Bee will automatically land at its current location. Monitor the Bee closely as it does an emergency landing. Retrieve it from the emergency landing site and consult the maintenance manual [Ref. 2]

Battery Failure

Indication	Condition	Remedy
Battery Failure	The battery has experienced a failure.	The battery is damaged and requires replacing. Please contact Sunflower Labs for further instructions. If in flight, the Bee will automatically land at its current location. Monitor the Bee closely as it does an emergency landing. Retrieve it from the emergency landing site and consult the maintenance manual [Ref. 2]

Contingency Volume Violation

Indication	Condition	Remedy
Contingency Volume Violation	The Bee has breached the contingency volume.	If in flight, the Bee will automatically land at its current location. Monitor the Bee closely as it does an emergency landing. Retrieve it from the emergency landing site and consult the maintenance manual [Ref. 2] .

Control Failure

Indication	Condition	Remedy
Velocity Control Failure	The Bee is unable to control its velocity.	The Bee will automatically land at its current location. Monitor the Bee closely as it does an emergency landing. Retrieve it from the emergency landing site and consult the maintenance manual [Ref. 2] .
Loss of Control	The Bee has become uncontrollable.	This is a serious issue that might be caused by the Bee being damaged. Please contact Sunflower Labs for further instructions.

Land Immediately

Indication	Condition	Remedy
Landing in place required	Air traffic detected in the Critical area. Automatic reactions are disabled.	Follow the procedure outlined in 5.7 Normal Procedures - Air Traffic Monitoring.

Sensor Failure

Indication	Condition	Remedy
Accelerometer Failure	All accelerometers have failed.	Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated. Please contact Sunflower Labs before performing the calibration.
Barometer Failure	All barometers have failed.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.

Estimator Failure	The Bee is unable to correctly determine its position and orientation.	Place the Bee into the Hive. Soft reboot the Bee. Wait a few minutes until the GPS acquires a good signal and the estimator properly initializes.
Bee GPS Failure	The Bee GPS has failed	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
Gyroscope Failure	All gyroscopes have failed.	Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated. Please contact Sunflower Labs before performing the calibration.
Magnetometer Failure	All magnetometers have failed.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.

Critical Vibrations

Indication	Condition	Remedy
Dangerously High Vibrations	The Bee is registering abnormally high vibrations that impact flight safety	Inspect the Bee for damage as described in the maintenance instructions.

8.1.2. Warning Alerts

Air Traffic

Indication	Condition	Remedy
Air Traffic Warning	There is air traffic in the amber traffic cylinder.	Wait for the air traffic to leave.

Battery Low

Indication	Condition	Remedy
Battery Too Low to Continue Mission	The Bee's battery level is insufficient to complete the requested mission.	Wait until the Bee is sufficiently charged.

Battery Issue

Indication	Condition	Remedy
Battery Too Hot to Fly	The Bee's battery is too hot to allow flying without risking damage to the battery.	Wait for the battery to cool down.
Battery Too Cold to Fly	The Bee's battery is too cold to allow flying without risking damage to the battery.	Wait for the battery to heat up.
Battery Data Timeout	The Bee is not receiving data from the battery.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.

Bee Hardware Failure

Indication	Condition	Remedy
Motor Failure	The motors or ESCs have failed.	This is a serious issue that might be caused by the Bee being damaged. Please contact Sunflower Labs for further instructions.
SD Card Failure	Unable to write to the Bee's SD card.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.

Bee Initializing

Indication	Condition	Remedy
The Bee is Initializing	The Bee has just connected to the Hive and is still initializing.	Wait for the Bee to finish initializing.

Bee Reconnecting

Indication	Condition	Remedy
The Bee is Reconnecting	The Bee has just re-established communication with the Hive while in flight.	Wait for the connection to fully re-establish.

Bee Shutting Down

Indication	Condition	Remedy
Bee Shutting Down	The Bee is being shut down	Wait for the Bee to shut down.

Bee Not Connected

Indication	Condition	Remedy
Bee Not Connected to Hive	The Bee is not connected to the Hive.	If the Bee is in flight, it will automatically return to the Hive and land. If the Bee is in the Hive do the following: Make sure the Bee is turned on. When turned on, it can take several minutes until the Bee connects. If the issue persists, navigate to the Settings → Radio page in the CS and properly configure the radio settings. Set the SSID of the Bee that is about to be connected, select the search option and press the pair button. Pairing could take up to 5 minutes.

Control Issue

Indication	Condition	Remedy
Velocity Control Issue	The Bee is experiencing issues while controlling its velocity.	Monitor the Bee as it is returning to the Hive. Either the Bee is fighting strong winds or may be damaged. Inspect the Bee for damage after the flight.

Excessive Winds

Indication	Condition	Remedy
Excessive Winds Detected	The Bee is experiencing excessive wind speeds that may impact flight performance.	The Bee will automatically return to the Hive and land. Wait for the winds to calm down.

Flight Geography Violation

Indication	Condition	Remedy
Flight Geography Violation	The Bee has breached the flight geography.	The Bee will automatically return to the Hive.

Hive Hardware Failure

Indication	Condition	Remedy
UPS Failure	The Hive UPS has failed.	Contact Sunflower Labs Customer Support.

Hive Initializing

Indication	Condition	Remedy
The Hive is Initializing	The Hive has just booted up and is still initializing.	Wait for the Bee to finish initializing.

Hive Shutting Down

Indication	Condition	Remedy
Hive Shutting Down	The Bee is being shut down	Wait for the Hive to power down.

System Error

Indication	Condition	Remedy
System Services Failing	Some services are unable to run correctly	Reboot the Hive. If the issue persists, contact Sunflower Labs Customer Support.

Maintenance Due

Indication	Condition	Remedy
Hardfault	The Bee has encountered a fatal error	A Service Technician must inspect the Bee before returning it into service.
Maintenance Required	Maintenance procedures need to be completed before further flights can take place.	Perform the maintenance by following the instructions in Settings → Maintenance .
Test Flight Required	A test flight is required to complete the maintenance procedure before further flights can take place.	Perform the test flight by following the instructions in Settings → Maintenance .
Support Review Required	Support needs to review the performance of the system before further flights can take place.	Wait for further instructions from Sunflower Labs Customer Support.

Remote ID Failure

Indication	Condition	Remedy
RemoteID Failure	The Remote ID hardware is faulty or one or more Remote ID parameter is missing or not configured properly	Contact Sunflower Labs Customer Support.

Return Immediately

Indication	Condition	Remedy
Return to Hive required	Air traffic detected in the Warning area. Automatic reactions are disabled.	Follow the procedure outlined in 5.7 Normal Procedures - Air Traffic Monitoring.

Roof Not Closed

Indication	Condition	Remedy
Roof Not Closed	The Hive roof is open.	Close the roof.

Self-Diagnostics

Indication	Condition	Remedy
Motion Detected	Accelerometers have detected movement while landed in the Hive.	Make sure that the Bee is still in the Hive. Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated. Please contact Sunflower Labs before performing the calibration.
Self-Test: Accelerometers Inconsistent	Accelerometer measurements are not consistent.	Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated. Please contact Sunflower Labs before performing the calibration.
Self-Test: Attitude	The Bee appears to be tilted.	Place the Bee such that it is leveled in the Hive. Check that the Hive is leveled.
Self-Test: Avionics Power	Avionics input voltage is not within the allowed range.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
Self-Test: Charger	Bee does not have contact with the charging rings.	The Bee will initiate the “hopping” procedure automatically. If this doesn’t solve the problem, make sure the Bee is appropriately

		placed in the Hive such that it has contact with the charging rings. Ensure that the charging rings are clean.
Self-Test: Estimator	Position or attitude estimates are unstable.	Reboot the Bee. Wait for a few minutes to allow the estimator to initialize and stabilize.
Self-Test: GPS	The GPS quality is insufficient.	Make sure that the Bee has a clear sky visibility and remove any potential obstacles that might obstruct the sky view. The Hive roof is not considered an obstacle. If the issue still persists, hard reboot the Bee. Wait for a few minutes to allow the GPS modules to acquire a stable signal.
Self-Test: Bad Gyroscope Measurements	Gyro measurements are out of expected range.	Verify that the Bee is not shaking. Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated. Please contact Sunflower Labs before performing the calibration.
Self-Test: Gyroscopes Inconsistent	Gyroscope measurements are not consistent.	Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated. Please contact Sunflower Labs before performing the calibration.
Self-Test: GPS Accuracy	The Bee and the Hive GPS modules have a big measurement offset.	This error might be fixed automatically, wait for up to 10 minutes to allow the automatic error resolution. If the issue persists for more than 10 minutes do the following: • Re-run the Hive GPS survey in. • Reboot the Bee. • Wait for a few minutes to allow the GPS modules to acquire a stable signal. • If the error still persists, re-run the GPS survey-in.
Self-Test: Bad Landing Camera Measurements	The landing camera is reporting unexpected measurements.	Make sure the beacon in the Hive is not covered by dirt or debris and the landing camera on

		the Bee is clean.
Self-Test: Magnetometers Inconsistent	Magnetometer measurements are not consistent.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
Self-Test: Radio	The radio quality is insufficient.	Reboot the Bee. If the problem persists, run the channel scan on the Settings → Radio page in the CS, and switch the radio channel to the one with least interference.
Self-Test: Obstacle Sensors	Range sensors are reporting unexpected measurements.	Make sure the roof is closed. Clean the range sensor covers.

Sensor Error

Indication	Condition	Remedy
Accelerometer Error	One accelerometer has failed.	Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated. Please contact Sunflower Labs before performing the calibration.
Barometer Error	One barometer has failed.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
Beacon Sensor Failure	The beacon sensor or the beacon have failed.	Clean the downward facing camera cover glass on the Bee and the beacon cover in the Hive. Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
Bee GPS Quality Low	The GPS signal quality is insufficient for precise navigation.	Make sure that the Bee and the Hive have a clear sky visibility and remove any potential obstacles that might obstruct the sky view. The Hive roof is not considered an obstacle.
Hive GPS Failure	The Hive GPS has failed.	Contact Sunflower Labs Customer Support
Gyroscope Error	One gyroscope has failed.	Reboot the Bee. If the error persists after rebooting, the Bee might need to be calibrated.

		Please contact Sunflower Labs before performing the calibration.
Magnetometer Error	One or more magnetometers have failed.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
Range Sensor Error	Range sensor has failed.	Check that the range sensors windows are not covered with dirt or obstructed in any other way. Reboot the Bee. If the error persists while the Bee is landed, that might implicate hardware issues; in that case please contact Sunflower Labs for further instructions.
High Vibrations	The Bee is registering abnormally high vibrations that may impact flight performance	Inspect the Bee for damage as described in the maintenance instructions.

Setup Incomplete

Indication	Condition	Remedy
Hive Placement Incorrect	There is a large difference between the configured Hive GPS location and the survey in location.	Update the configured Hive location if it has been moved, re-run the survey-in.
Bee Configuration Not Applied	The Hive was not able to successfully upload or download all the required parameters from the Bee.	Wait for the configuration changes to be applied.
Missing Geocage	The Geocage was not uploaded	Contact Sunflower Labs Customer Support.
Incompatible Versions	The system is running an incompatible combination of software versions.	Reboot the Hive and the Bee. If the issue persists, contact Sunflower Labs Customer Support.
GPS Survey In Invalid	The Hive GPS Survey In needs to be run before flying.	Run the Survey In in Site Setup → GPS survey-in
GPS Survey In in Progress	The Hive GPS Survey In is running.	Wait for the Survey In to complete.
Invalid Site Configuration	The site is not fully configured.	Complete the missing configuration in Site Setup before flying.

Calibration in Progress	The Bee calibration procedure is active.	Complete the calibration procedure.
Applying Configuration	Configuration changes are being applied.	Wait for the configuration changes to be applied.
Map Update in Progress	An update to the site map is being applied.	Wait for the site map update to be applied.

Update in Progress

Indication	Condition	Remedy
Bee Updating	The software on the Bee is being updated.	Wait for the update to complete.
Hive Updating	The software on the Hive is being updated.	Wait for the update to complete.

Weather

Indication	Condition	Remedy
Bad Weather	Weather conditions are not sufficiently good for a safe flight.	Wait for good weather conditions.

System Locked

Indication	Condition	Remedy
Locked by Support	The system has been locked by Sunflower Labs Customer Support due to an issue detected by them.	Wait for further instructions from Sunflower Labs Customer Support.

8.1.3. Caution Alerts

Air Traffic Failure

Indication	Condition	Remedy
Air Traffic Monitor Failure	The traffic monitoring system has failed.	Ensure that the System is connected to the network, the DAA system feature is enabled and configured according to the instructions in the installation manual [Ref. 1]. If the issue persists, reboot the Hive. If the issue still persists, contact Sunflower Labs Customer Support.

Flight Advisories

Indication	Condition	Remedy
Flight Advisory: High Restriction	There are high restriction flight advisories in effect at your site.	Review the advisories and check with local authorities whether flying is acceptable. If appropriate, acknowledge the advisories in Status → Flight advisory
Flight Advisory: Medium Restriction	There are medium restriction flight advisories in effect at your site.	Review the advisories and check with local authorities whether flying is acceptable. If appropriate, acknowledge the advisories in Status → Flight advisory
No Flight Advisories Report Received	The system is unable to fetch local flight advisories from the server	Ensure that the System is connected to the network. Reboot the Hive. If the issue

		persists, contact Sunflower Labs Customer Support.
Flight Advisories Report Outdated	The system is unable to fetch local flight advisories from the server	Ensure that the System is connected to the network. Reboot the Hive. If the issue persists, contact Sunflower Labs Customer Support.
The Flight Advisories Configuration is Missing	Some data needed to fetch local flight advisories is missing	Reboot the Hive. If the issue persists, contact Sunflower Labs Customer Support

No Pilot In Command

Indication	Condition	Remedy
Pilot Disconnected	No pilot-in-command is connected	Verify the connectivity of the device running the CS. If necessary, log in from an alternative device or coordinate with another pilot to take control.
Pilot Connection Timeout	No pilot has been connected for 1 minute	Verify the connectivity of the device running the CS. If necessary, log in from an alternative device or coordinate with another pilot to take control.

Weather Advisory

Indication	Condition	Remedy
Marginal Weather	Weather conditions are marginal and may affect flight safety.	Check local weather conditions. If deemed safe, proceed with caution.
Weather Not Available	The Hive is unable to fetch local weather data.	Reboot the Hive. If the issue persists, contact Sunflower Labs Customer Support.

8.1.4. Informational Alerts

Air Traffic

Indication	Condition	Remedy
Air Traffic	There is air traffic in the cyan traffic cylinder.	Monitor the air traffic. Takeoff is not disabled.

Battery Temperature

Indication	Condition	Remedy
Battery Too Hot to Charge	The Bee's battery is too hot to charge without risking damage to the battery.	Wait for the battery to cool down.
Battery Too Cold to Charge	The Bee's battery is too cold to charge without risking damage to the battery.	Wait for the battery to heat up.

Charger Temperature

Indication	Condition	Remedy
Charger is too hot	The Bee's battery charger is too hot to charge without risking damage.	Wait for the Bee to cool down.

Cloud Not Connected

Indication	Condition	Remedy
No Cloud Connection	The Hive does not have a connection to the cloud.	Check the internet connection of the Hive. If the issue persists, reboot the Hive. If the issue still persists, contact Sunflower Labs Customer Support.

Geo Awareness Degraded

Indication	Condition	Remedy
Geo Awareness Degraded	The system's ability to determine whether the Bee is within a geo zone is degraded.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.

Hive Hardware Issue

Indication	Condition	Remedy
Control Panel Failure	The Hive control panel has failed and is disabled.	Contact Sunflower Labs Customer Support.
Roof Error	The Hive roof is not reporting its state properly.	Reboot the Hive. If the issue persists, contact Sunflower Labs Customer Support.
Critically Low UPS Power	The Hive is running on UPS power. The UPS battery is almost depleted and the system will imminently shut down.	The Hive has to be powered using the main power connection to allow the battery to recharge.

Charging Ring Failure	The charging rings are not providing power	Toggle the charging rings in Settings → Power & Controls . If the issue persists, contact Sunflower Labs Customer Support.
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Preparing Update

Indication	Condition	Remedy
Bee Update Preparation	The Bee is preparing for a software update.	Wait for the update to complete. Takeoff is not disabled. Flying will prevent the update from completing.
Hive Update Preparation	The Hive is preparing for a software update.	Wait for the update to complete. Takeoff is not disabled. Flying will prevent the update from completing.

System Issue

Indication	Condition	Remedy
System Services Not Ready	Some services are still getting ready	Wait for the services to be ready.

Maintenance Due Soon

Indication	Condition	Remedy
Maintenance Required Soon	Maintenance procedures will soon be due. Once due, flights are prohibited until the maintenance procedures have been followed.	Perform the maintenance by following the instructions in Settings → Maintenance .

Payload Issue

Indication	Condition	Remedy
Headlight Failure	The Bee's headlights are not working.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
Camera Failure	The Bee's main camera is not working.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.

Thermal Camera Failure	The Bee's thermal camera is not working.	Reboot the Bee. If the issue persists, contact Sunflower Labs Customer Support.
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Hive Power Lost

Indication	Condition	Remedy
Hive Mains Disconnected	The Hive is running on UPS power.	The Hive has to be powered using the main power connection to allow the battery to recharge.
Low UPS Power	The Hive is running on UPS power. The UPS battery is low and the system will shut down soon.	The Hive has to be powered using the main power connection to allow the battery to recharge.

8.2. Bee State Failures

The next set of issues are related to the Bee state. Attempt solving these issues only when all the Bee health issues are solved. When the Bee is in the Hive, Bee state failures are shown in the mission status panel.

Follow this guide to troubleshoot Bee State failures.

Bee State	Condition	Remedy
Error	The Bee is in an error state or the system is unable to determine the Bee's state.	Place the Bee into the Hive. Soft reboot the Bee and wait a few minutes to give the GPS module time to acquire a stable signal. Pair the Hive with the Bee, if necessary.
Landed outside	The Bee has landed outside of the Hive.	Go to the location of the Bee shown on the map and locate the Bee. Carefully inspect the Bee for damages and complete the maintenance checklist.
Killed	The Bee's motors have been shut off.	Go to the location of the Bee shown on the map and locate the Bee. Carefully inspect the Bee for damages and complete the maintenance checklist.
Returning fallback	The Bee is performing an emergency return to the Hive where it will land in the Hive.	No pilot intervention is required, but the pilot should pay close attention to the behavior of the Bee while it is returning to the Hive.

Bee State	Condition	Remedy
Landing fallback	The Bee is performing an emergency landing in place and will not land in the Hive.	No pilot intervention is required, but the pilot should pay close attention to the behavior of the Bee and the area where the Bee will be touching down. The pilot should be ready to kill the power to the motors at a moment's notice if the situation warrants.
Paused	The Bee's mission has been paused and the Bee is hovering in place.	The Bee flight may be resumed if the Bee is in stable flight.
Emergency Paused	The Bee's mission has been paused during an emergency reaction, and the Bee is hovering in place.	The Bee flight may be resumed if the Bee is in stable flight.

In case the proposed solutions do not solve the issue, please contact Sunflower Labs for further instructions.

8.3. Mission Execution Failures

Mission execution failures include errors that are caught when the Bee tries to execute a command. Mission execution failures are shown as notifications in the top-right corner of the CS screen.

In case the below proposed solutions do not solve the issue, please contact Sunflower Labs for further instructions.

Follow this guide to troubleshoot Mission Execution failures.

Execution Failure	Condition	Remedy
there is no suitable inspection location	Requested inspection location can not be observed from any obstacle free position on the map.	Request a different inspection point
no path could be found to the destination	The system could not plan a path from the current Bee position to the requested observation point.	The observation point is not reachable, modify the observation point's position.
there was an issue communicating with the Bee	Failed to communicate with the Bee.	If the Bee health communication is failing, look at the Bee health troubleshooting, otherwise retry sending the same request.
the weather is bad	Weather conditions are not sufficiently good for a safe flight.	Wait for good weather conditions.

Execution Failure	Condition	Remedy
there are active flight restrictions	Flight restrictions are imposed in the Bee operating area.	Wait for the restrictions to be lifted - review the advisory and acknowledge it (see Acknowledgments).
the Hive roof failed to open	Roof failed to open.	This might happen due to an obstruction or a hardware issue. In case of the latter, please contact Sunflower Labs for further instructions.
the charging rings failed to turn off	Failed to control the charging ring.	Turn off the charging ring and turn them back on again. If the problem persists, contact Sunflower Labs customer support
some Bee health checks are failing		Refer to the descriptions of the Bee State Failures
Bee sensor tests are failing		Refer to the descriptions of the Alerts
the Hive is running low on battery	The Hive is powered by the UPS and the battery level is insufficient to complete the mission.	The Hive has to be powered using the main power connection to allow the battery to recharge.
the Bee does not have a good position estimate	The Bee's position estimate is insufficient	Reboot the Bee
a test flight is required	A test flight is required	Perform the test flight
the Bee did not receive a valid mission	The Bee didn't receive a valid mission	Retry to send mission command (or reboot)
the Bee was unable to start a flight log	The Bee was unable to start a flight log	Retry to send mission command (or reboot)
the Bee detected an anomaly with the motors	The Bee detected an anomaly with the motors	Retry to send mission command
the Bee could not start the mission	The Bee could not start the mission	Issue the command again.
the landing beacon could not be turned on	Failed to turn the landing beacon on.	This implies a hardware problem. Reboot the Hive. If the problem persists, contact Sunflower Labs customer support.
the Bee does not have sufficient battery	Battery level is insufficient to perform the requested action.	Leave the Bee to recharge or request a different action such as a shorter mission.

Execution Failure	Condition	Remedy
commands are being issued too quickly	Too many requests to the Bee are being made in a short period of time.	Do not repeat commands as quickly.
this command has been superseded by a higher priority command	The requested command was superseded by another command that arrived while this one was being processed.	Issue the command again.
the source information for this command is not valid	The app or the user does not have the permissions to execute that command.	Use the official app and log in with your user account and try to issue the command again. If the problem persists, contact your system administrator.
the system is locked for maintenance	System maintenance is being performed by Sunflower Labs support and the system is not available at this time.	Wait for the maintenance to complete
the Site is not configured properly	The site needs to be configured or it is not configured properly. The Bee cannot take off.	Contact Sunflower Labs customer support.
the system is performing actions that prohibit flying	The system is too busy to perform a flight at the moment	Wait a while. If the problem persists, contact Sunflower Labs support.
the system is not running the correct software version	The system component versions are not compatible	Reboot the Hive and the Bee. If the problem persists, contact Sunflower Labs customer support.
some Hive services are unable to run	One of the services in the system is not functioning properly	Reboot the Hive. If the problem persists, contact Sunflower Labs customer support.
there is air traffic nearby	There is air traffic in the amber or red traffic cylinder.	Wait for the air traffic to leave.
the air traffic monitor is not configured correctly	The air traffic subsystem has failed or is misconfigured.	Reconfigure the air traffic system. Reboot the Hive. If the problem persists, contact Sunflower Labs customer support
the pilot in command has disconnected	The pilot has lost connection or has closed the CS	Check the device's connection.
the person issuing this command is not the pilot in command	There is currently no active pilot logged in	Take/re-take control of the Bee following the Pilot Handover procedure
the Hive control panel has failed	The Hive control panel has failed	Contact Sunflower Labs customer support.

Execution Failure	Condition	Remedy
of an unexpected error	failure of unknown reason (state switch denied)	Retry to send mission command (or reboot)
of an unknown error	An unknown error occurred.	Reboot the Hive. If the problem persists, contact Sunflower Labs customer support

9. Reporting Accidents, Incidents and Mishaps

The operator is required to contact the appropriate authorities in case of any major accident of the Bee that caused damage to property, caused a collision with another aircraft, or caused serious or fatal injury.

The operator is instructed to check for property damages and bodily harm after any incident where the Bee leaves the operator's property and to report any such incidents to the local authorities.

While the Bee is in flight, a lot of the flight data is sent to the Hive in real-time where it is stored in a database. All flight log data is stored on-board the Bee in flash memory. This complete log file is transmitted to the Hive after every flight if the Bee is in range of the telemetry link with the Hive. Should the Bee crash or get lost, this on-board flash storage serves as a “black box” for the Bee from which the data can be retrieved if the memory card survives the crash. The memory card is located inside the main body of the Bee and any detrimental damage to it is extremely unlikely if the crash does not result in a fire.

The flight data log files and/or the memory card can be handed to the authorities or accident investigation bodies or Sunflower Labs support.

After any accident, incident or mishap, the operator is required to inspect the Bee and the Hive for damage. Further flights are prohibited until the operator completes the maintenance checklist.

10. Safety Guidelines

Warning:

- This product is NOT intended for children. Keep children away from the Bee and the Hive at all times.

Warning:



Moving Parts

- The Bee and the Hive contain moving parts. Keep body parts out of the motion path of the Hive and away from the propeller blades of the Bee.

10.1. Flight Operations

Caution:

- Stay away from rotating propellers and motors.
- Be familiar with the system, the selected flight mode and all safety functions and warnings.

10.2. Battery Safety Notice

Caution:

- *DO NOT use swollen, leaking or damaged batteries. In such situations contact Sunflower Labs immediately.*
- *The batteries should be used at a temperature between 0 and 60°C.*
- *High temperature can cause an explosion or fire while low temperature will reduce the performance of the battery.*
- *DO NOT pierce the battery.*
- *The electrolytes in the battery are HIGHLY corrosive. If any electrolytes come in contact with your skin or your eyes, wash the affected area immediately and seek medical support.*
- *DO NOT use a battery if it has been involved in a crash or on a hard impact.*
- *Extinguish any battery fire using sand or a dry powder fire extinguisher.*

11. Template Emergency Response Plan (ERP)

This section contains an example template for a typical emergency response plan.

This emergency response plan is to be executed in case the emergency procedures in [Emergency Procedures](#) fail during an emergency response.

The operator must complete this template or an equivalent emergency response plan with all the pertinent information before operating the Sunflower Labs Beehive system. The completed emergency response plan may be approved as part of the operational approval for a specific installation site.

Note: *The emergency response plan must be readily available to the pilot-in-command during all UAS operations.*

Note: *The emergency response plan completed by the operator must adhere to any and all applicable local and federal laws.*

PRIORITY		ACTION ITEMS																
1	 KEEP CALM <i>but do not waste time</i>	GET AN OVERVIEW ☐ Put on high visibility jackets ☐ Assess the situation • What has happened? [if FLY-AWAY: Go to 4–Alert ATS] • Who is involved? • Who is affected? ☐ Ensure own protection																
2	 THINK	CONSIDER POTENTIAL HAZARDS fuels, batteries, toxic substances, dangerous goods containers, vegetation, wind, parachute ballistics, ... ☐ Danger for rescuers? ☐ Fire hazard? ☐ Explosion hazard?																
3	 PROTECT	SECURE THE PERIMETER / SAVE LIVES ☐ Get to the scene of the accident ASAP ☐ Secure the scene of the accident ☐ Ensure own protection ☐ Clear people from the danger zone ☐ Keep a safe distance from the accident site																
4	 ALERT 	MAKE AN EMERGENCY CALL (if necessary) <table border="1" style="width: 100%;"> <thead> <tr> <th>EMERGENCY</th> <th>Tel.</th> <th>HEMS</th> <th>Tel.</th> </tr> </thead> <tbody> <tr> <td>Police</td> <td>Tel.</td> <td>Fire Dept.</td> <td>Tel.</td> </tr> <tr> <td></td> <td></td> <td>Poisoning</td> <td>Tel.</td> </tr> <tr> <td colspan="2">Closest ATS / Aerodrome</td> <td colspan="2"></td> </tr> </tbody> </table> ☐ Where did it happen? ☐ Who is reporting? ☐ What has happened? ☐ When did it happen? ☐ How many people are injured? ☐ Any other hazards, dangerous goods? ☐ Potential hazards to rescue helicopters? (cables, obstacles, weather) ☐ My callback number: _____ ☐ Wait for any questions!	EMERGENCY	Tel.	HEMS	Tel.	Police	Tel.	Fire Dept.	Tel.			Poisoning	Tel.	Closest ATS / Aerodrome			
EMERGENCY	Tel.	HEMS	Tel.															
Police	Tel.	Fire Dept.	Tel.															
		Poisoning	Tel.															
Closest ATS / Aerodrome																		

5	 HELP 	If necessary: EXTINGUISH FIRE ☐ Do not put yourself in danger ☐ Fight fire (with fire extinguisher or fire blanket) ☐ Take particular care with rechargeable batteries! Explosion hazard! ☐ Brief the arriving fire service
		If necessary: PROVIDE FIRST AID ☐ Check injured people for signs of life ☐ Stop any bleeding ☐ If person unconscious → RECOVERY POSITION ☐ If person unconscious AND not breathing normally → REANIMATE C: CIRCULATION (perform CPR) A: AIRWAYS (clear for breathing) B: BREATHING D: DEFIBRILLATION ☐ Brief the rescue service

THEN		ACTION ITEMS
1	SECURE THE ACCIDENT SITE	<u>KEEP EVIDENCE</u> ☐ Block access to the site until the rescue team / investigators arrives ☐ Do not alter the state of the site ☐ Do not move wreckage, objects or bodies until STSB investigators arrive, except to save lives
2	REPORT THE ACCIDENT	<u>IMMEDIATELY REPORT ACCIDENTS AND SERIOUS INCIDENTS</u> In case of: ☐ severe or fatal injury to persons ☐ collision with manned aircraft → report immediately to the aviation department of the Federal Transportation Safety Board: ☐ Tel. _____ ☐ from outside the country: Tel. _____
3	INFORM THE COMPANY	☐ Contact _____ ☐ No contact with media ☐ Follow the Occurrence Reporting process of your local civil aviation authority if a safety-related incident with serious or fatal injuries to persons or involving manned aircraft occurred. Contact _____ within _____ hours.

In the following table all necessary emergency equipment, such as high-visibility jackets, first-aids kits, fire extinguishers, defibrillators, etc. shall be listed.

EMERGENCY EQUIPMENT		
	Item	Number Required Location
☐		
☐		
☐		
☐		
☐		
☐		

In the following table all pertinent emergency contacts shall be listed.

EMERGENCY CONTACTS		
	Person	Phone Number E-mail
☐		
☐		
☐		
☐		
☐		
☐		

12. References

Ref	Doc Number	Revision	Description
1	BH1-SYS-UIM	A	Beehive 1 Installation Manual
2	BH1-SYS-UMM	A	Beehive 1 Maintenance Manual
3	UAS REST API	-	Sunflower Labs REST API https://swagger.sunflower-labs.com/ui/

13. Acronyms/Terms

Acronym	Description
AGL	Above Ground Level
AMSL	Above Mean Sea Level
API	Application Programming Interface
ASAP	As Soon As Possible
ATS	Air Traffic Services
Bee	The Unmanned Aircraft (UA)
BIT	Built-In Test
BVLOS	Beyond Visual Line Of Sight
C3	Command, Control and Communication
CONOPS	Concept of Operations
CPR	Cardiopulmonary Resuscitation
CS	Control Station (the App)
CSV	Comma-Separated Values
DAA	Detect And Avoid
DABS	Drone Aircraft Broadcast System (Switzerland)
DRID	Direct Remote Identification
ERP	Emergency Response Plan

E-RTL	Emergency Return To Land
FLARM	Flight Alarm
FOV	Field Of View
FS	Flight Status
FTE	Flight Technical Error
Geocage	The overall volume in which the Bee is allowed to fly. This overall volume or cage is divided into several sub-volumes: Planning Volume, Flight Geography and Contingency Volume.
Geo-zone	Designated portions of airspace established by national authorities where drone flights are permitted, restricted, or excluded to manage safety, security, and privacy.
Geo-awareness	A feature that allows the user to be aware of geo-zones when planning and conducting flights
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GS	Ground Station (The Hive)
HD	High Definition
HEMS	Helicopter Emergency Medical Service
Hive	The Ground Station (GS)
HSI	Human System Interface
ICAO	International Civil Aviation Organization
LED	Light-Emitting Diode
MOR	Mandatory Occurrence Reporting
MTOM	Maximum Take-Off Mass
NOTAM	Notice to Airmen
PiP	Picture-in-Picture
REST	Representational State Transfer
RP	Remote Pilot
RPAS	Remotely Piloted Aircraft System
RPIC	Remote Pilot In Command
RTK	Real-Time Kinematic
RTL	Return To Land

SAR	Search And Rescue
SD	Secure Digital
SORA	Specific Operational Risk Assessment
SSID	Service Set Identifier
STSB	Swiss Transportation Safety Board
sUAS	Small Unmanned Aircraft System (The Beehive)
TFR	Temporary Flight Restriction
UA	Unmanned Aircraft (The Bee), the sUAS
UAS	Unmanned Aircraft System (The Beehive)
UIM	UAS Installation Manual
UMM	UAS Maintenance Manual
UOM	UAS Operations Manual
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator
VLOS	Visual Line Of Sight

14. Record of Revisions

Rev	Date	Change Description
A	3 Mar 2025	Initial release.
B	26 Mar 2025	• Added explanation for “Excessive Winds” indication.
C	9 Jul 2025	• Added automatic abnormal procedure for Battery Timeout and Battery Temperature. • Added explanation of battery too cold indication in battery status indications. • Added map menu shortcuts to save the current map view. • Added explanations for Battery Timeout and Battery Temperature in-flight failure indications. • Change Low Battery indication to Battery Low. • Changed the button for the visibility light in the bee controls section. • Added Battery Temperature and Battery Timeout to the troubleshooting instructions.
D	25 Sep 2025	• Documented new alert indication • Updated keyboard shortcuts • Updated map menu and map shortcuts
E	29 Apr 2026	• Updated the list of camera profiles • Patrol missions now land in the Hive at the end of the route • Added description of alerts for degraded geo-awareness • Added description of alerts for required pilot intervention