



Installation Manual

Beehive 1

BH1-SYS-UIM / Rev A

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1. Scope

This document contains the installation and setup instructions for the Sunflower Labs Beehive 1 system. The document also contains an overview of the control station (CS), the ground station (GS), called the Hive, and instructions for preparing and executing the operational checkout flight (OCF) of the Unmanned Aircraft (UA), called the Bee.

Successful completion of the installation instructions in accordance with the information provided herein ensures that the system is properly set up and ready for use, however, the system will not be loaded with pre-programmed waypoints and routes. The programming of the waypoints and the missions shall be carried out according to the instructions of the UAS Flight Planning Manual [[Ref 3](#)].

2. Installation Limitations

- The Beehive 1 system can only be operated outdoors. Never install and operate the system indoors.
- The installation instructions for a suitable mounting provision is not subject of this document. It is the responsibility of the operator to furnish an adequate mounting platform for the Hive.
- Installing the Hive on a moving platform or vehicle is prohibited.
- The safety aspects pertinent to connecting the power supply cable of the system to the electrical network of the property is not the subject of this document. It is the responsibility of the operator to provide electrical power to the system while obeying the applicable local regulations.
- The safety aspects pertinent to connecting the ethernet cable between the Hive and the router is not subject of this document. It is the responsibility of the operator to install an ethernet interface between the router and the Hive.
- Disposing the system or its components is not subject of this document. It is the responsibility of the operator to either send the system or its individual components back to the manufacturer or discard them according to the local regulations.
- System operation without a valid obstacle database is prohibited.
- Operating the system without a valid geocage is prohibited.

3. General Installation Requirements

- The Hive must be installed outdoors and placed under open sky. There shall not be any obstruction in a 60-degree cone above the Hive. See section [Placing the Hive](#) for further details.
- The Hive should be placed on a solid, level surface. The Hive must not be tilted by more than 5 degrees in any direction. The Hive has leveling feet and the Hive provides an electronic level indicator on the CS to assist with leveling.
- Unless otherwise specified in the operational authorization, the Hive must be installed in a safe takeoff and landing area. A 2-meter safety buffer around the Hive should be provided and the takeoff / landing area should not be publicly accessible.
- The electrical power connection must provide standard 100-240V 50/60Hz AC power. The cable length should be kept below 30 m to the power outlet.
- The ethernet cable used for the installation should be Cat5e (or higher standard) and with a maximum point to point length of 100 m.
- The ethernet connection to the Hive must provide a stable internet connection with:
 - Minimum upload speed: 6 Mbps
 - Minimum download speed: 6 Mbps
 - Latency: <250ms unloaded and <500ms loaded
- The CS application must be run on a device with a stable internet connection with
 - Minimum upload speed: 1 Mbps
 - Minimum download speed: 6 Mbps
 - Latency: <250ms unloaded and <500ms loaded
- During installation and before the operational checkout flight (OCF), the Bee must be registered with the local authorities and must be identified according to the local regulations (if applicable).

4. General Precautions

Caution:

Heavy load lifting might cause injury. The Hive should always be carried by 2 people. To carry the Hive, use the built-in retractable handles. Ask for assistance in transporting/moving packages that you cannot safely move yourself.



Caution:

The handles of the Hive represent trip hazards when they are deployed. Stow the Hive handles when not used for carrying and the control panel is not in use.

Caution:

Items blocking free movement of the movable surfaces of the Hive can cause damage to the system. When defining the location of the Hive, ensure that there is enough space around the Hive to operate the roof and that no obstacles are blocking the way.

Caution:

Propellers' laceration hazard. When handling the Bee while it is powered, make sure that you do not have your fingers, hand, or any other body parts or parts of clothing in the propellers' way.

Caution:

Careless transportation might cause damage to the system. Never move the Hive while the Bee is inside the Hive sitting on the charging rings.

Caution:

Changing system configuration during operation might upset the overall system operation. Never move the Hive while the unmanned aircraft (UA) is in flight.

Caution:

Inadvertent activation of moving surfaces might cause injury. Never move the Hive while it is powered. Remove power from the Hive whenever it is moved or relocated.

5. Pre-installation Activities

Complete the mapping of the area overflown by the system. Contact Sunflower Labs for mapping options and instructions.

The system is delivered in a fully-calibrated status. Therefore, no calibration of the navigation systems of the UAS is required at the operational site.

6. Hive Setup

6.1. Unpacking the Hive

The Beehive system arrives in a pallet-sized crate.

Open the top of the box, then carefully remove the cardboard sleeve. Remove the Bee from the Hive and set it aside carefully by placing it upside down on a flat and stable surface.

Remove the foam from the Hive, then grab the Hive by its carrying handles on both sides (2 persons) and remove it from the lower box.

Retain the box and the protective foam for future transportation of the system. The original packaging is designed to provide the highest possible level of protection to the system components during transportation.

6.2. Placing the Hive

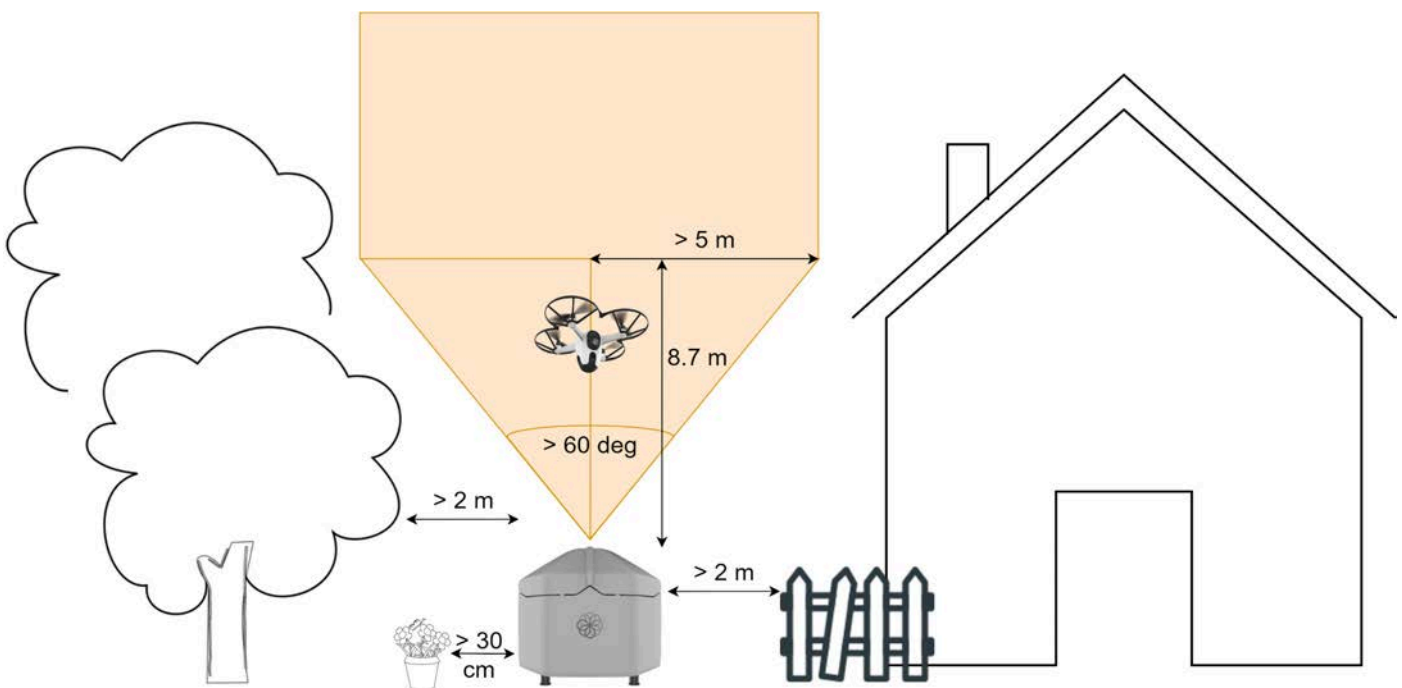
Place the Hive outdoors, under open sky such that the visibility of the sky is mostly unobstructed in all directions at elevations above 60 degrees. Narrow occlusions in one or more directions may be acceptable.

The GPS constellation quality might be severely affected by obstacles blocking the RF signal path. The GPS survey-in will determine if the GPS quality at the installation location of the Hive is adequate for safe UAS operations.

A 60-degree cone above the Hive up to altitude of 8.7 m AGL, and a 5 m radius cylinder onward may never contain any obstructions in the vicinity of the Hive since it defines the take-off and precision approach volume of the Bee.

The 2-meter obstacle clearance around the Hive provides a safety margin in case the Bee misses a precision approach due to a last-second disturbance or a technical issue.

An area of 30 cm around the Hive should be clear of any obstruction on the ground to provide room for the roof to operate freely and allow access to the retractable carrying handles and the control panel.



Secure the takeoff and landing area and ensure that people keep a safe distance of at least 2 meters from the Hive. Ideally, the Hive should be fenced in or be placed in an otherwise inaccessible location.

Once the Hive is placed at the desired location, the Hive may be bolted down by its legs if deemed necessary.

6.3. Level the Hive

The Hive needs to be leveled to within 5 degrees. To accomplish this use a bubble level placed on the Hive funnel.

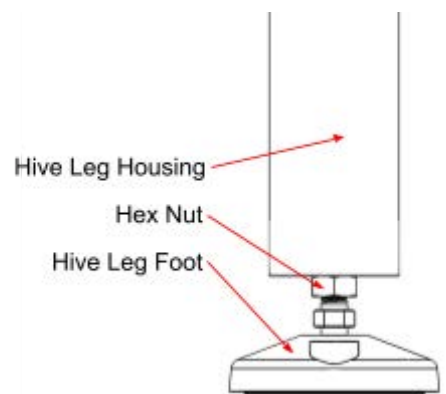
If you have access to the CS, the app provides a built in bubble level to support leveling the Hive. Navigate to **Status** → **Hive Status** and scroll down to the **Level** section.



To accomplish this, the Hive features height adjustable legs.

Rotate the hex nut until it reaches the bottom to allow full adjustment range. Adjust the Hive leg foot by turning its bolt. This will cause the Hive leg to move to the desired direction. Tighten the hex nut against the leg housing to prevent movements in the assembly.

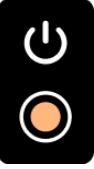
After leveling the Hive, the hive legs may be bolted down if deemed necessary.



6.4. Hive Control Functions

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



	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

	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

Note: When the Hive is connected to power, it will initially blink all 3 LEDs at the same time.

6.5. Connecting the Hive

The Hive requires power and an ethernet connection.

Via the ethernet interface, a standard DHCP service must be provided by the router which allows the Hive to join a network with access to the internet. The internet connection may also be provided by an LTE modem or a Starlink kit connected directly to the Ethernet port of the Hive.

The Hive operates from standard 100-220V 50/60Hz AC power. The Hive operates on a battery backup (UPS) when power is not available or interrupted.

First, connect the ethernet cable to a functioning network that provides DHCP, then connect power to the Hive.



Both the power cable and the ethernet cable should be secured to the Hive frame beam with cable ties to provide strain relief.

Check that all three status LEDs on the control panel are ON. This may take up to two minutes after power is applied to the system.

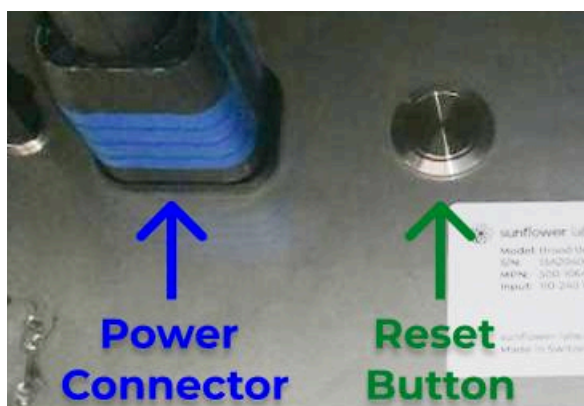
6.5.1. Troubleshooting

If the Status LEDs do not turn ON or are blinking intermittently, do the following:

	LED (blue) :	Blinking or Off	Check mains power
	LED (yellow) :	Blinking for over 10 minutes or Off	Reboot the system by following the steps below
	LED (green) :	Blinking	Check your internet connection. If the problem persists, reboot the system and/or the router by following the steps below.

Note: When the Hive control panel is disabled, i.e., locked, all 3 LEDs will blink 3 times when a control panel button is pushed.

6.5.2. Rebooting the Hive



The electronics bay in the Hive provides a system reset button.

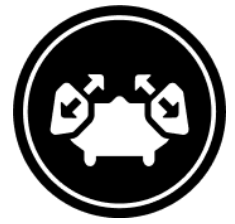
Turn off the Hive completely, by first disconnecting the power to the system and then by pushing the RESET button switch for 5-10 seconds.

Then, reconnect the power supply to the system.

6.6. Initial Roof Test

Ensure that there are no obstructions around the Hive within 30 cm.

Press the roof motion button on the Hive control panel and monitor the roof while it is opening.



Both roof panels should open all the way until they hug the Hive side panels.

While the Hive is open, ensure that no foreign objects are left inside of the Hive funnel or around the roof arms. Check that the charging rings and the landing beacon are clear of debris, such as leaves, dust, gravel, etc.

Press the Roof motion button and monitor the roof while opening. Ensure that both roof panels stop at their fully open position.

After the above step is complete, stow the Hive handles by pushing them underneath the Hive.

6.7. Pre-flight Check and Weather Camera Setup (if required)

6.7.1. General

In order to perform a visual preflight check, which might be required depending on the operational approval, an external camera is required to verify the following:

- Physical condition of the sUAS
- No damage of the drone structure (cowlings, propeller guard)
- No damage to the propellers and motors
- No damage to the Hive (roof, body, landing funnel)
- No person or vehicle is located within the safety exclusion zone of the Hive
- The weather reported by the Hive is reasonable (wind and precipitation)

6.7.2. Pre-flight Check Camera Requirements

The quality of the pre-flight check camera shall be adequate enough to discern the current weather conditions and to determine the structural integrity of the Hive and the Bee (see next section).

Ideally, the camera meets the following requirement:

- High-resolution (4K)
- Zoomable (4x optical zoom minimum)

6.7.3. Pre-flight Check Camera Installation

- The camera must be installed near and directed towards the Hive (see example below)



- The camera must provide a view of the safety inclusion zone around the Hive



- The camera must be zoomable onto the Bee to provide a clear view of the Bee structure and its propellers.



7. Control Station (CS) Setup

The CS runs as a web application on a computer or tablet with a stable internet connection. For maximum compatibility, use Chrome on a PC or Safari on iOS/macOS.

Warning: Do not use Internet Explorer, Opera mini, or UC browser for Android

7.1. CS Network Speed Test

Ensure that the device running the CS application has a stable and fast enough internet connection.

To test the connection, use a service like speedtest.net or fast.com.

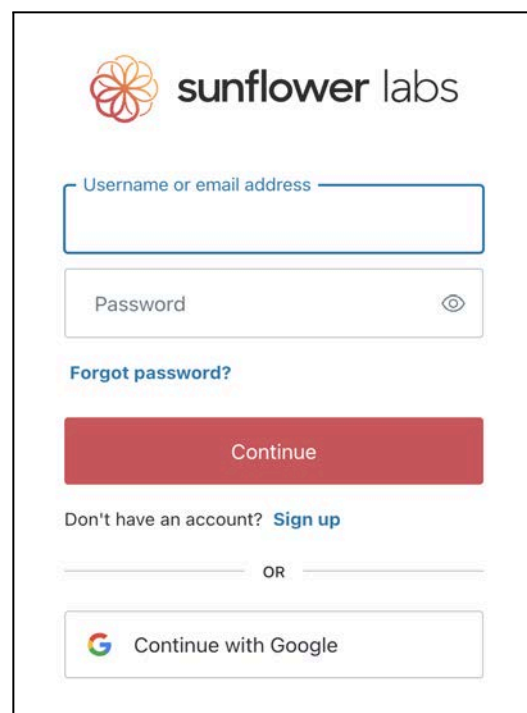
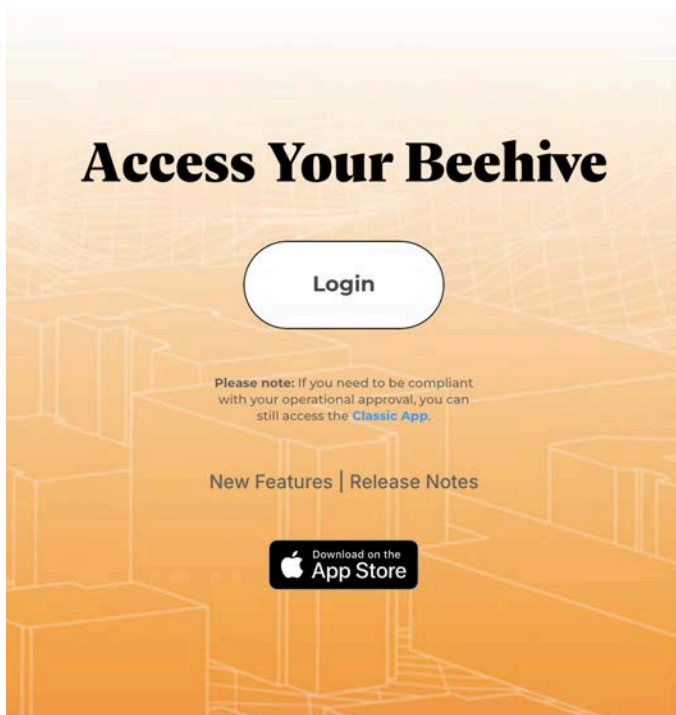
If the Download/Upload speed is less than the value specified in section 3 of this document for the CS then the device with its current internet connection shall not be used for UAS operations with the Beehive 1 system.

7.2. Initial Connection

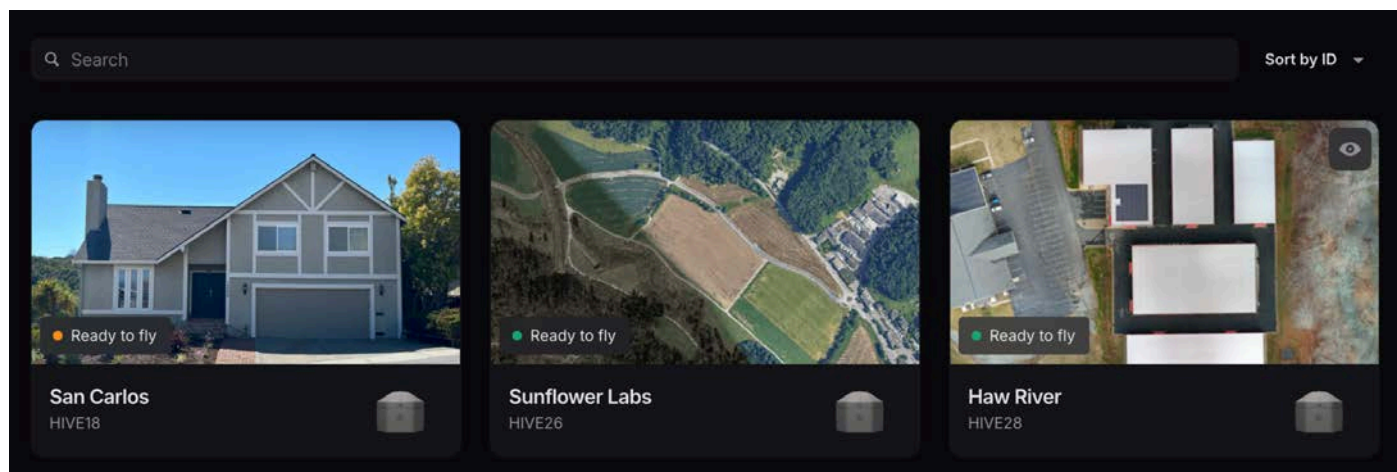
In a web browser go to the following URL:

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

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

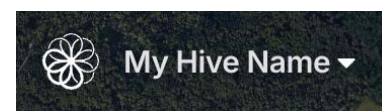
The image shows the Sunflower Labs login form. It has a white background. At the top left is the Sunflower Labs logo, which is a stylized orange flower. To its right is the text 'sunflower labs'. Below the logo is a text input field labeled 'Username or email address'. Below that is a password input field labeled 'Password' with an eye icon to toggle visibility. Below the password field is a link 'Forgot password?'. Below that is a red button labeled 'Continue'. Below the button is a link 'Don't have an account? Sign up'. Below that is a horizontal line with the word 'OR' in the center. Below the line is a button with the Google logo and the text 'Continue with Google'.

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 Hive that you have access to.

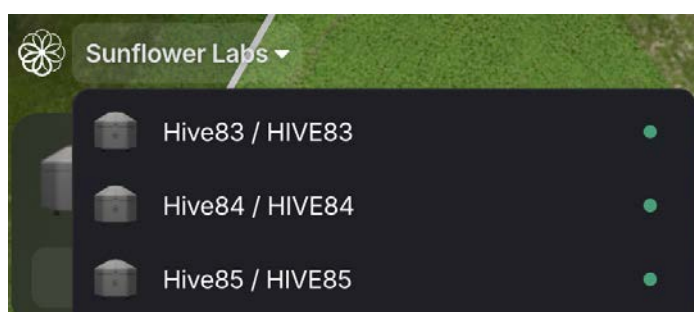


If the selector panel is presented, select the Hive you want to connect to.

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.

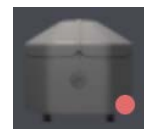


If you have access to multiple systems, there will be a dropdown next to the Hive name that will let you easily connect to a different Hive.



Refer to the UAS operations manual [\[Ref 1\]](#) for detailed instructions about how to use the CS.

The UAS status icon should be red since there is no Bee connected to the Hive yet.



Note: The site configuration for the installation location is preconfigured in the Hive by Sunflower Labs before shipment.

As soon as the CS loads on the control device, the map and configuration of the property should be shown in the CS.



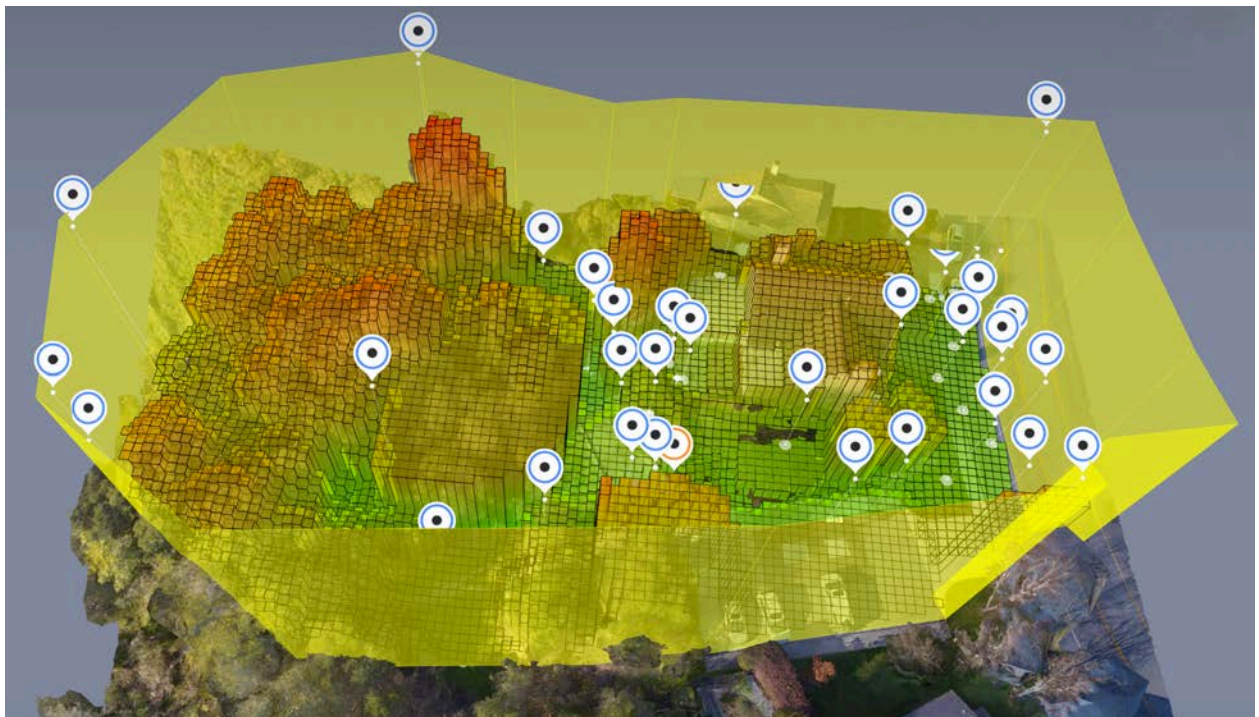
Before proceeding, perform the following site configuration checks:

- The 3D map is complete and correct (press the '3' key on the keyboard)
- The 3D obstacle map is complete and correct (press the 'o' key on the keyboard)
- The 2D map is correct (press the '2' key on the keyboard)
- The geocache is configured correctly (press the 'g' key on the keyboard when on the 3D map)
- The Hive position in the 3D map is correct to within 1 m of where it is actually placed
- The orthomosaic is showing correctly in the 2D map, if applicable

Should any of the maps or the configuration be incorrect, contact Sunflower Labs.



The geocage in the 2D Map



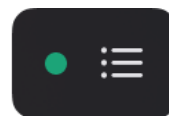
The Geocage and Obstacle Map in the 3D Map

Warning: For VLOS flights, refrain from starting the flight if the external lighting conditions are excessively bright or overly dark.

Warning: The pilot is responsible for adjusting the display brightness to ensure optimal visibility during operations conducted in direct sunlight.

7.3. Roof Test

Navigate to the **Settings** → **Power & Controls** tab under the Menu button.



This tab provides the controls to operate the Hive roof.

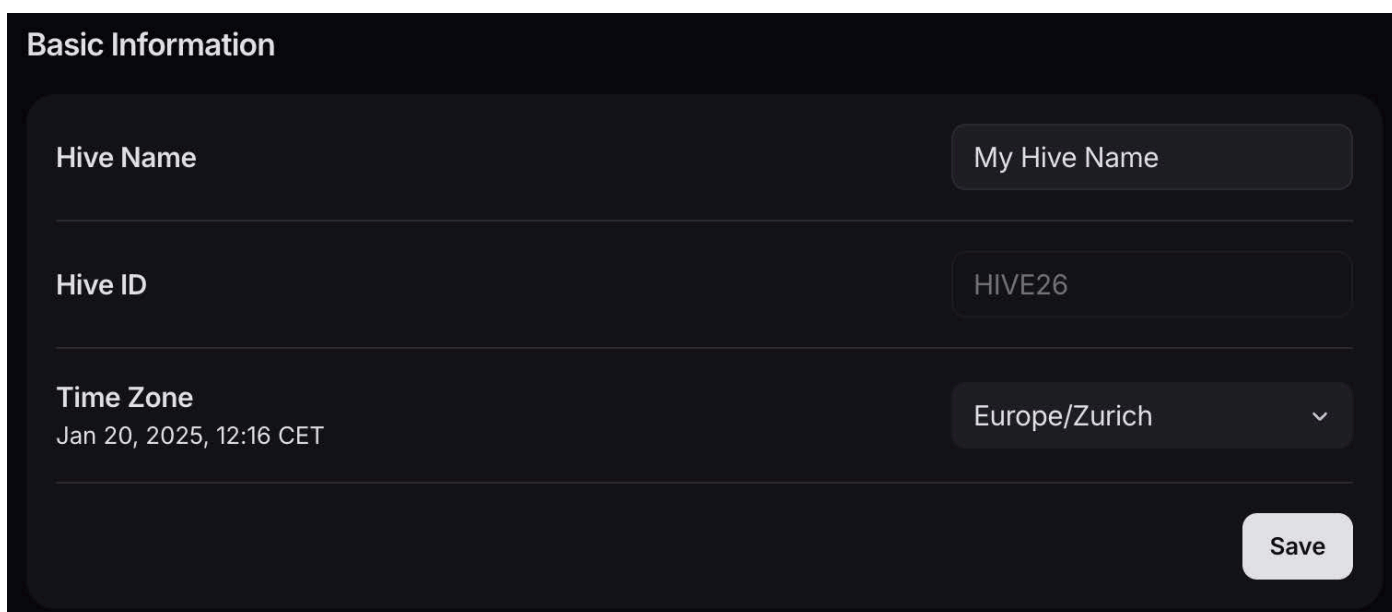


Push the **Open** button under **Hive Roof**. Confirm that the Hive roof is opening and that the Hive Roof status indicates that the roof is now open. Then, push the **Close** button and verify that the roof closes and that the Hive Roof status indicates that the roof is now closed.

7.4. Hive Name and Hive Time Zone

Navigate to the **Settings** → **General** tab.

Set a unique name for the Hive (**Hive Name**) and select the correct **Time Zone** for the installation location. Then click **Save**.



7.5. Hive GPS Survey-In

It is now time to run a GPS survey-in for the Hive GPS ground reference receiver.

Navigate to the **Settings** → **Site** tab.

Click the **Run Survey-In** button, then confirm it by clicking the **Run** button.

Run survey-in

The overall Survey-In process may take up to 15 minutes. While the GPS survey is in progress the CS will show that the survey is **Active**.

GPS Survey-In

Status	Active
Precision	5833.00 mm
Duration	19 s

Run Survey-in

When the survey completes, the CS should show that the survey is no longer active and that its status is **Valid**, showing a maximum **Precision** of 2000 mm.

GPS Survey-In

Status	Valid
Precision	2000.00 mm
Duration	0 s

Run Survey-in

Note: If the Hive location has been modified/updated in the Web App, a Bee health failure is shown and the user is required to re-run the Hive GPS Survey-In.

7.6. Hive Network Speed Test

From the menu button navigate to **Status** → **Hive Status** and scroll down to Network Speed Test.

Run Speed Test

Click on **Run Speed Test** to initiate a network speed test.

After the speed test completes, make sure that the *Download* and *Upload* speeds are at least 6 Mbps. If this is not the case, change the internet connection to the Hive.

Network Speed Test

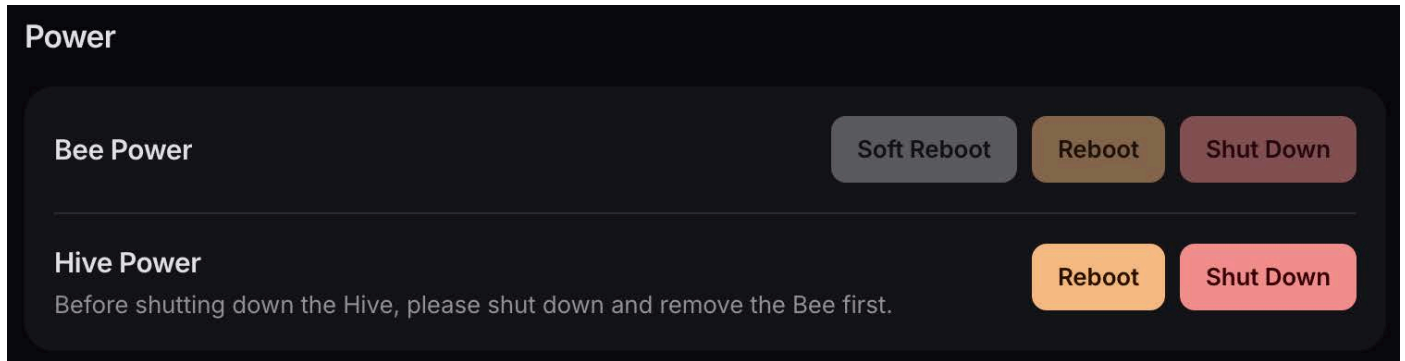
Status	Completed
Server	roadrunner.wingo.ch
Location	Zurich, Switzerland
Ping Jitter	1.9 ms
Ping Latency	10.1 ms
Download	639.91 Mbps
Upload	98.92 Mbps
Loss	0.000

Run Speed Test

7.7. Hive Reboot and Shutdown

The controls to reboot or shut down the Hive can be found under **Settings** → **Power & Controls**.

Before unplugging the Hive, the Hive should always be shut down with the **Shut Down** button in the GCS.



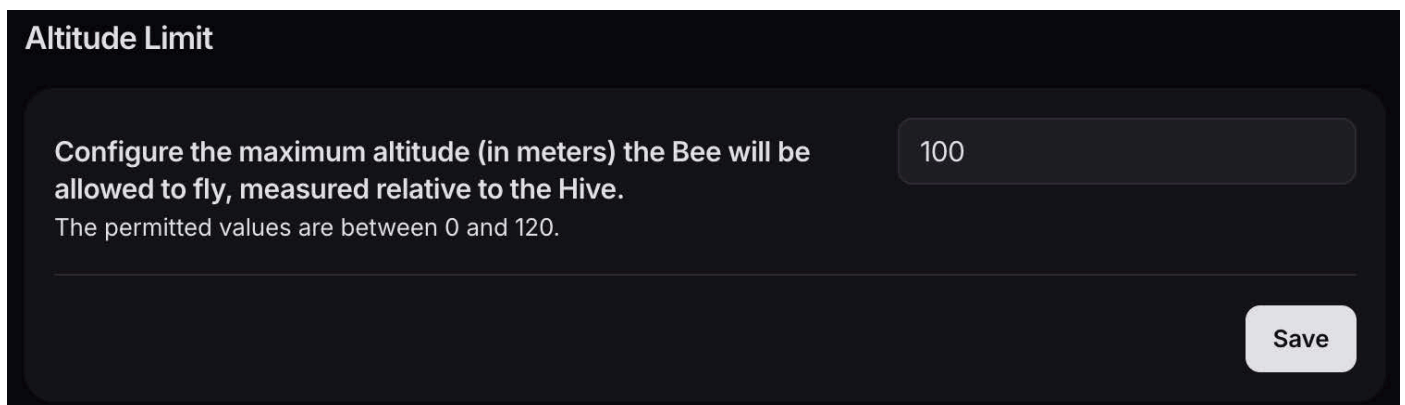
The screenshot shows a dark-themed interface titled "Power". It contains two main sections: "Bee Power" and "Hive Power". The "Bee Power" section has three buttons: "Soft Reboot" (grey), "Reboot" (brown), and "Shut Down" (dark red). The "Hive Power" section has two buttons: "Reboot" (orange) and "Shut Down" (pink). Below the "Hive Power" buttons, there is a text instruction: "Before shutting down the Hive, please shut down and remove the Bee first."

Caution: Before rebooting, shutting down the Hive, or removing power from the Hive, ensure that the Bee is not in flight.

Caution: Before shutting down the Hive for transport, remove the Bee from the Hive and power off the Bee. If packing the system in the original shipping box, the Hive roof must remain open.

7.8. Setting the Altitude Limit Manually

Navigate to the **Settings** → **Site** tab.



The screenshot shows a dark-themed interface titled "Altitude Limit". It contains a text input field with the value "100". Below the input field, there is a "Save" button. The text above the input field reads: "Configure the maximum altitude (in meters) the Bee will be allowed to fly, measured relative to the Hive. The permitted values are between 0 and 120."

Change the Altitude Limit to the desired value (always check the operational authorization first to make sure to remain compliant).

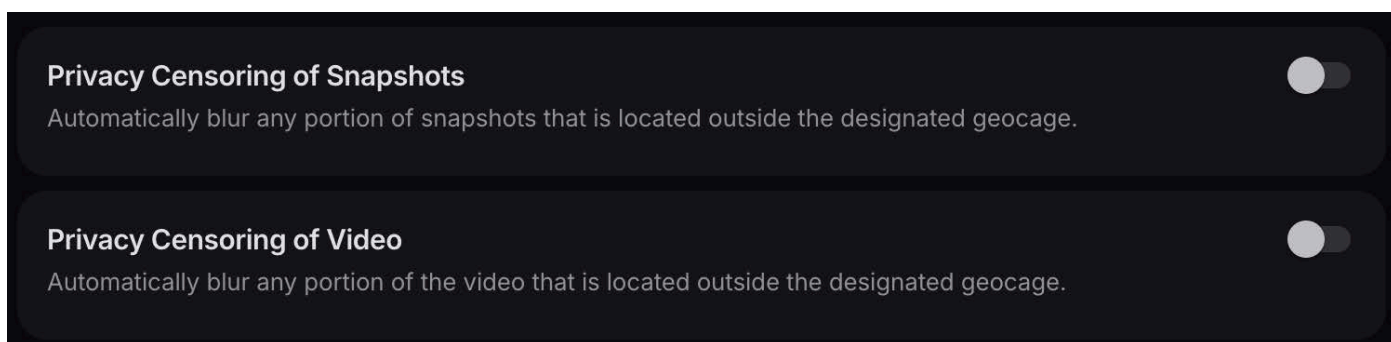
Click the **Save** button.

7.9. Geofence Privacy Settings

To make the Beehive System compliant with the privacy and data protection requirements contained in Regulation (EU) 2016/679 (General Data Protection Regulation), a privacy filter for the snapshots, called **Privacy Censoring of Snapshots**, and a privacy filter for the video, called **Privacy Censoring of Video**, have been implemented.

When these settings are enabled, the system will apply a blurring filter in the snapshots and the video to everything that is outside the geocage.

To enable the filter, navigate to the **Settings** → **Features**



Enable both **Privacy Censoring of Snapshots** and **Privacy Censoring of Video**.

7.10. The Detect and Avoid System (if required)

7.10.1. General

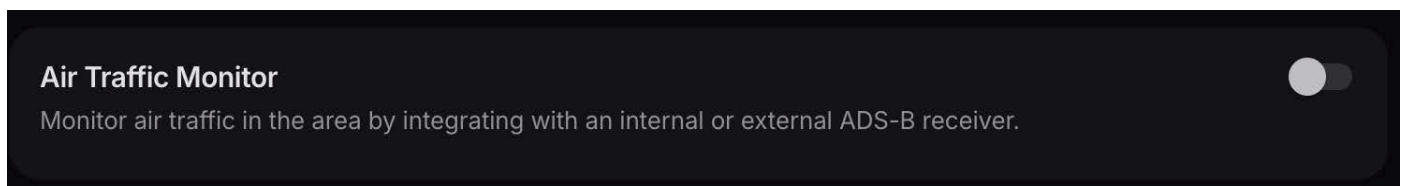
The Detect and Avoid system is an optional system that can be enabled in the Beehive 1 system whenever deemed necessary because of local regulations. For safety (detection of cooperative aircraft) it is highly recommended that you enable the DAA system.

Note: The detect and avoid receiver is part of **most** Beehive 1 system packages. If it is not it has to be acquired separately. The recommended, compatible detect and avoid receiver type is the **Air!Squitter** from jetvision at airsquitter.com. To set up the receiver, follow the User Manual of the Air!Squitter system https://jetvision.de/manuals/AirSquitter_Manual_V1.pdf

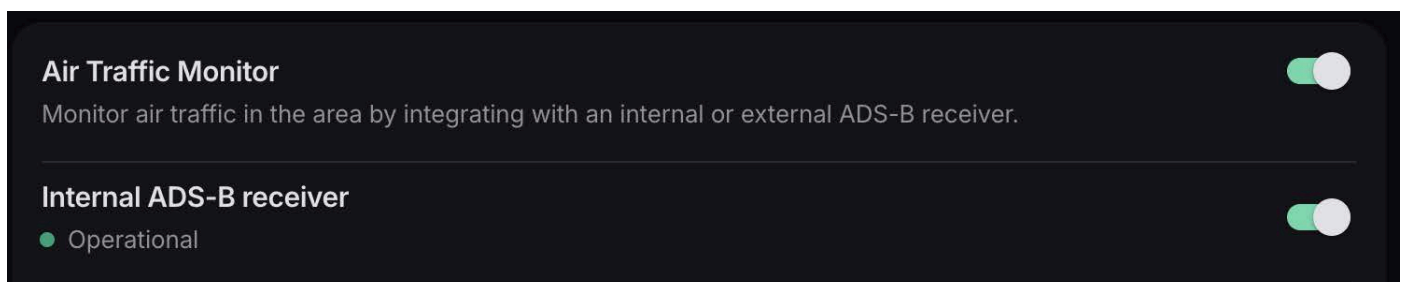
7.10.2. Setup

To set up the detect and avoid receiver in the system, navigate to **Settings** → **Features** and scroll to **Air Traffic Monitor**.

Enable the **Air Traffic Monitor** feature.



If using the internal receiver, enable **Internal ADS-B Receiver**.



If using an external receiver, enable **External ADS-B Receiver**.



If using an Air!Squitter receiver, select **HTTP** for the **Connection Type** and for the **Connection URI** provide the IP address of the receiver as follows:

http://<local ip address>/aircraftlist.json

Click **Save**.

External ADS-B receiver

● Not Operational

Connection Type

HTTP

TCP

Connection URI

http://<IP address>/aircraftlist.json

Save

When the air traffic monitor is on and configured and **Automatic reaction** is enabled then the Bee will automatically return to land in the Hive if an aircraft is detected inside of the amber cylinder and the Bee will simply land in place where it is if ever traffic is detected inside of the red cylinder.

Enable automatic reaction

If air traffic is detected in the emergency area (**red**) - the Bee will automatically start landing in-place
If air traffic is detected in the warning area (**amber**) - the Bee will automatically return to the Hive

Caution: If Automatic reactions are disabled, the remote pilots are required to react to air traffic incursions with the appropriate maneuver. Refer to the UAS Operations Manual for more details.

Note: Detect and Avoid System is always referred to as “Air Traffic” on the CS graphical user interface.

Detect and Avoid System = “Air Traffic”

8. Bee Setup

8.1. Unpacking

Note: This section only applies if the Bee has been shipped separately from the Hive. Otherwise, the Bee was removed from the packaging when unpacking the Hive ([section 6.1](#))

Caution: When unpacking or otherwise handling the Bee, ensure that you do not touch the collision avoidance sensor covers (black circles on the body) or the landing or video camera lenses. Ensure the obstacle avoidance sensor covers and the camera lenses are clean before putting the Bee in the Hive.

Caution: Only handle the Bee by holding it at its motor arms.

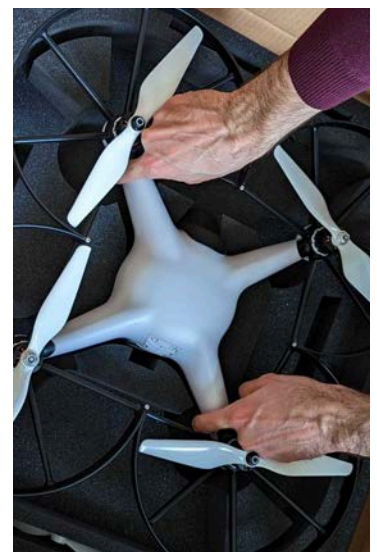
Open the package and remove the top layer of foam covering.



Remove the Bee from the box by holding it by its motor arms as shown in the picture above.

Retain the box and the protective foam for future transportation of the Bee.

Remove the “Remove before flight” sticker from the payload camera.



8.2. Marking the Bee

If local regulations require the Bee to be marked with a registration or operator identification number then install a placard with the required identification number on the Bee before the Bee is first powered and placed into the Hive.

For the purpose of this identification you can use either a waterproof pen or a printed label.



Example of Registration Number attached to a motor arm

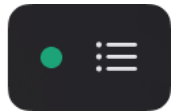
Note: *In the US, the Bee must be marked with a UA registration number (<https://faadronezone.faa.gov/>).*

Note: *In Europe, the Bee must be marked with the drone operator registration number (<https://www.easa.europa.eu/>).*

The registration number and/or the operator registration number must also be entered in the CS (see below).

8.2.1. Enter the CAA Operator ID (EU only)

Navigate to the **Settings** → **General** page under the Menu button.
Insert your CAA Operator ID then click **Save**.



Operator

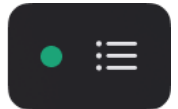
CAA Operator ID

ABCx23k3ldkr5lfk-***

Save

8.2.2. Enter the UA Registration Number (US only)

Navigate to the **Settings** → **General** page under the Settings button.
Insert your **Bee Registration Number** (UA Registration Number) then click **Save**



Registration

Bee Registration Number
The maximum length is 20 characters.

FA3QFRXNM9

Save

8.3. Powering up the Bee

Caution: Never place the Bee in the Hive while the charging rings are powered on.

Turn off the charging rings under the **Hive Controls** in **Settings** → **Power&Controls**

Charging Rings

Required to allow automatic recharging. Disable only if you need to perform maintenance.



Open the Hive roof from the CS or push the roof button on the Hive control panel.

Hive Roof

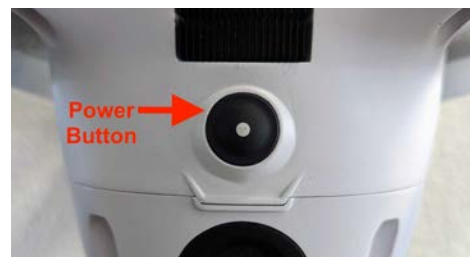
● Open

Open

Close

Stop

Hold the power button on the Bee pressed for at least 4 seconds until the Bee powers up. You will hear the Bee beep and turn on its cooling fan.



Place the Bee in the Hive landing funnel on the charging rings.



Close the Hive roof again.

Hive Roof

● Closed

Open

Close

Stop

Turn on the charging rings.

Charging Rings

Required to allow automatic recharging. Disable only if you need to perform maintenance.



8.4. Connecting the Bee to the Hive

The Bee and the Hive use a dedicated radio link for communication. When connecting for the first time, the Bee has to be paired with the Hive.

Note: When installing a new Beehive system, the Bee has already been paired to the Hive in the factory.

Navigate to **Settings** → **Radio** and scroll to the **Pairing** section.

Pairing

Unique Bee SSID
Must match the unique SSID set on the Bee.

Select Channel or Search
Search will check every channel.

Unpair Search

Note: Before pairing a Bee to a Hive, ensure that the Bee has been turned on for at least 1 minute before proceeding.

In **Unique Bee SSID** enter the serial number of the Bee. Click the **Search** button. The procedure can take up to 5 minutes. The successful pairing message will be displayed once paired.

The serial number of the Bee can be found on a label attached to the back side of the Bee.



Note: After the Bee and the Hive are paired once, the Bee should automatically pair with the Hive within a minute whenever it is turned on at each subsequent power up. If it does not, repeat the pairing procedure. If the problem persists, please contact Sunflower Labs for further instructions.

The default radio link channel may not be suitable for your location due to other, interfering radio sources, therefore, running a radio channel scan is highly recommended.

Channel Scan

Selection mode

Set the radio channel manually, or automatically after the channel scan.

Auto

Manual

Channel scan

Scan for the highest quality channel. The connection to the Bee is intermittent during channel scan. Takes about 90 seconds.

Run Channel Scan

In case the change of the radio channel is required, run the channel scan. Pressing the **Run Channel Scan** button will cause the system to go into a channel quality test mode, and once the channel quality test is completed the system will show a quality indication for each channel.

Run Channel Scan

Channel Scan

Selection mode

Set the radio channel manually, or automatically after the channel scan.

Auto

Manual

Channel scan

Scan for the highest quality channel. The connection to the Bee is intermittent during channel scan. Takes about 90 seconds.

Run Channel Scan

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The recommended frequency channels are indicated in green and depending on the position of the AUTO/MANUAL toggle switch, the channel with the highest quality of service will be either selected automatically by the system or can be activated by the user manually.

Set the radio transmit power in accordance with local radio regulations regulations.

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Power

Change Transmit Power

20 dBm = 100 mW (CH)

23 dBm = 200 mW (JP)

30 dBm = 1000 mW (US)

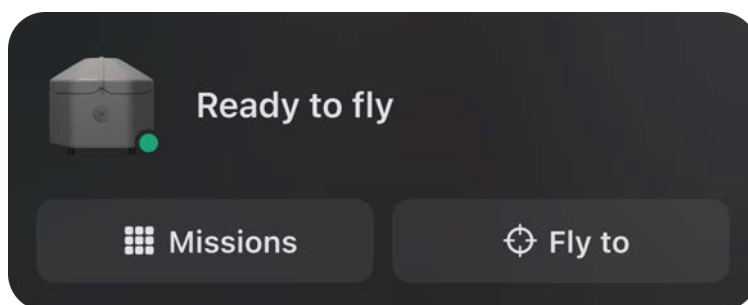
20 dBm



8.5. Bee Status

The Bee should now be connected to the Hive and status information from the Bee should be visible on the CS.

While it is initializing the Bee status may show “Error” for a couple of minutes. The status should then change to “Ready to fly”. The UAS status is always shown in the top-left of the CS.



Note: The GPS initialization may take several minutes during which the Bee GPS failure indication will be displayed and the UAS status icon will be red.

9. System Checkout (UAS)

9.1. Initial Pre-Flight Inspection

9.1.1. Physical Bee Inspection

Perform a Bee maintenance inspection before the first flight and whenever required. Refer to the UAS Maintenance Manual [[Ref 2](#)].

9.1.2. Physical Hive Inspection

Perform a Hive maintenance inspection before the first flight and whenever required. Refer to the UAS Maintenance Manual [[Ref 2](#)].

9.1.3. First Flight (Operational Checkout Flight) Checklist

- ☐ For this flight, the pilot must remain in visual line-of-sight with the Bee.
- ☐ All active participants have read and understood the UAS operations manual [[Ref 1](#)].
- ☐ The UAS maintenance was completed according to the UAS maintenance manual [[Ref 2](#)].
- ☐ The preflight checklist in the UAS Operations Manual [Ref 1] has been completed.
- ☐ Operational approval has been obtained from the competent authority, if necessary.

Caution: Always perform the first flight in good weather.

Warning: The first flight must only be performed in visual line of sight (VLOS).

While performing the operational checkout flight on the next page, fill out the following checklist.

- ☐ The Bee took off and hovered above the Hive.
- ☐ The Bee responded to the snapshot command.
- ☐ The radio performance was adequate during the entire flight. The radio status remained white during the entire flight.



- ☐ The Bee did not report a problem with GPS. The GPS indicator remained white during the entire flight.



- ☐ While hovering, the Bee held its position to within 30 cm (1 foot).
- ☐ The Bee did not exhibit any unusual vibrations. No high vibrations or critical vibrations were indicated.

Vibrations High

Vibrations Critical

- ☐ The live video was showing in the CS during the entire flight.
- ☐ The Bee landed in the Hive and the Hive roof closed after the landing.
- ☐ No other irregularities were observed with the Bee, the Hive, or the CS.
- ☐ The Bee was indicating that it was charging until fully charged.



Note: If any of the above tests failed, please contact Sunflower Labs.

9.2. Operational Checkout Flight (OCF)

Caution: Before the operational checkout flight the checklist must be completed up to the point in the checklist where the operational checkout flight is explicitly permitted.

The flight checklist in section [11.1.3. First Flight \(Operational Checkout Flight\) Checklist](#) must be completed and signed by the pilot. This first flight checklist is retained by the operator along with the completed installation checklist.

This first flight checklist must be completed again by the operator after anomalies have been detected and the Bee has been repaired.

Note: Before the system is put into regular operation, this checklist must be completed.

The goal of performing this operational checkout flight is to verify that:

- GPS performance is adequate at this location
- C3 link performance is adequate
- The Bee reaches a requested observation point
- The Bee hovering performance is adequate
- The video is streamed
- The Bee returns to the Hive and lands

In case of an emergency, the web application provides quick emergency controls such as pause, land here, and kill, which are described in the UAS operations manual [Ref 1].

For the first flight, the system provides an operational checkout flight function. During this flight, the Bee will take off from the Hive, climb to at least 4 meters above the Hive, hover for 30 seconds while rotation 360 degrees around its own axis, and then perform a precision landing into the Hive. While the Bee is hovering, the pilot will take a snapshot.

To perform the operational checkout flight follow these steps:

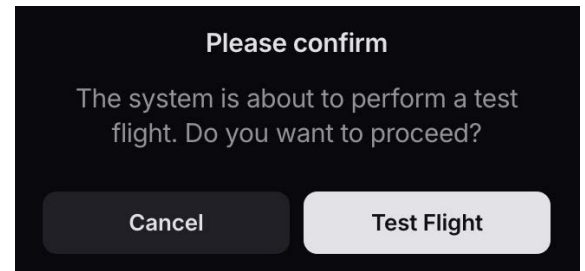
1. In the CS application, go to the **Settings** → **Power & Controls** tab and scroll down to the **Bee Controls**.
2. Click the **Perform a Test Flight** button.

Test Flight

The Bee will take off above the Hive, perform a 360 degree rotation and land back in the Hive.

Perform Test Flight

3. Click the **Test Flight** button to confirm that you want to proceed with the operational checkout flight.



4. While the Bee is hovering above the Hive, bring up the controls.
5. Click the Snapshot button in the lower right of the CS.



9.3. C3 link verification flight

Once the Operational Checkout Flight (OCF) is completed, perform the checkout flight for the verification of the C3 link performance within the operational volume.

1. Design a Route along the perimeter of the operational volume (geocage).
2. Initiate an Bee flight (Route) along the designed route and monitor the C3 link performance during the entire flight.
3. Verify that the C3 link quality is "Good" (at least 3 white bars) along the entire route.
4. For short time intervals (a couple of seconds) the signal strength is allowed to drop to the level defined as "Marginal" or "Bad" (amber or red bars), but it must recover and return back to the white band (3, 4 or 5 bars).
5. Do not plan Routes or Inspections in the operational volume where the C3 link quality is insufficient.



10. Installation Checklist

The following checklist must be completed and signed before the Beehive system installation is considered complete. The completed checklist shall be stored in the records of the operator.

Caution: Before the operational checkout flight, the checklist must be completed up to the point in the checklist where the operational checkout is explicitly permitted.

10.1. Installation Limitations

- ☐ The Beehive 1 system is not installed indoors.
- ☐ In case a mounting provision is constructed for the Hive, it has been built in compliance with the local regulation.
- ☐ The Hive is not installed on a moving platform or vehicle.
- ☐ The electrical power to the Hive has been provided in a manner that is compliant with the local regulations.
- ☐ The Ethernet cable between the Hive and the router has been connected in a manner that is compliant with the local regulations.
- ☐ If system components or the whole system are disposed of, those are done according to the local regulations.
- ☐ The system is programmed with a valid and accurate obstacle database.
- ☐ The system is programmed with a valid and accurate geocage.

10.2. General Installation Requirements

- ☐ The Hive is placed under open sky in accordance with the installation requirements
- ☐ The Hive has been placed on solid, level ground
- ☐ The takeoff and landing area provides enough safety buffer around the Hive
- ☐ The takeoff and landing area has been secured and is inaccessible to non-active participants and clearly marked
- ☐ The Hive is powered by a stable 100-220V 50/60Hz AC power source
- ☐ Suitable ethernet cable is sourced and used
- ☐ The Hive is connected to a stable, sufficiently fast internet connection
- ☐ The Bee is registered and marked as required (Operator ID or Registration ID)

10.3. Preinstallation Activities

- ☐ The mapping flight has been completed by a competent agency in accordance with instructions provided by Sunflower Labs.

10.4. Hive Setup

- ☐ The Hive has been unpacked according to the unpacking instructions
- ☐ The packing box and foams have been retained for future use
- ☐ The Hive has been placed at a location the GPS constellation quality is not significantly degraded
- ☐ The Hive has been placed at a location where sufficient obstacle clearance is provided for take-off and landing
- ☐ The Hive has been placed at a location where sufficient clearance from low level obstructions is provided for avoiding roof interference/damage
- ☐ (if required) External pre-flight check and weather camera is installed
- ☐ All 3 LEDs on the Hive control panel are on, and illuminate continuously
- ☐ The system has been connected to the router and to the electrical network
- ☐ Roof operation has been tested

10.5. Hive Setup

- ☐ The network speed of the CS device is adequate

- ☐ A connection between the CS and the Hive was successfully established
- ☐ The Hive status indicator is green
- ☐ The 3D map is complete and correct
- ☐ The 3D obstacle maps are complete and correct
- ☐ The 2D map is correct
- ☐ The geocage is set correctly
- ☐ The Hive position is correct
- ☐ The orthomosaic is showing correctly, if applicable
- ☐ The Hive has been leveled to an acceptable tilt
- ☐ The roof has been successfully operated from the GCS
- ☐ The Hive name was set
- ☐ The Hive time zone was set
- ☐ A Hive survey-in was run successfully
- ☐ The Hive GPS status is healthy
- ☐ The internet connection of the Hive is adequate
- ☐ Detect and avoid system is successfully setup (optional)

10.6. Bee Setup

- ☐ The UAS has been carefully removed from the box and is completely free of foreign objects
- ☐ The packaging is retained for later use
- ☐ The Bee has been marked with the required identification
- ☐ The Bee collision avoidance sensor covers are intact and free of any debris
- ☐ The “Remove before flight” sticker on the payload camera lens has been removed.
- ☐ The two camera lens covers on the Bee are free of scratches, debris, or smudges
- ☐ The charging rings were turned off
- ☐ The Bee was placed on the charging contacts inside the Hive
- ☐ The Bee was powered on
- ☐ The Hive roof was closed

- ☐ The charging rings were turned back on
- ☐ The Bee was successfully paired to the Hive
- ☐ The best radio channel was selected
- ☐ The transmit power was set to the legal maximum
- ☐ The Bee status icon (Bee) is green

10.7. Unmanned Aircraft System (UAS) Setup

- ☐ The Bee physical inspection has been successfully completed
- ☐ The Hive physical inspection has been successfully completed
- ☐ The first flight checklist has been successfully completed

Note: The UAS is now ready for the initial operational checkout flight in VLOS. Before proceeding ensure that the above checklist has been completed in its entirety and that the checklist header has been filled in.

- ☐ The operational checkout flight has been successfully completed
- ☐ The C3 link verification flight has been successfully completed

Installation Location

Installation Date

Installer Name

Installer Signature

11. Regular Flight Operations

Follow the guidance in the UAS Flight Planning Manual [\[Ref 3\]](#) for setting up additional flight zones and sweep patterns.

Operate the UAS in accordance with the UAS Operations Manual [\[Ref 1\]](#).

12. Maintenance

The system requires regularly scheduled maintenance and might require out-of-schedule maintenance on demand if and when system irregularities are detected.

Refer to the UAS Maintenance Manual [\[Ref 2\]](#) for detailed maintenance instructions, the required maintenance intervals, the maintenance checklist and the maintenance record keeping requirements.

13. Transportation and Packaging

When the UAS needs to be transported to a different location or is otherwise no longer required:

- Perform a flight and wait for the Bee battery to drain to 25 to 30%, then land the Bee
- Power off the charging rings by pushing the **Off** button in the **Charging Rings** section of the CS.
- Open the hive roof by pushing the roof toggle button on the Hive control panel or by pushing the **Open** button in the **Hive Roof** section of the CS.
- Remove the Bee from the Hive.
- Power off the Bee by holding the power button pressed for 5 seconds. The Bee will power off and its fan will be turned off.
- Place the Hive and the Bee back into the original packaging.

Note: Store and transport the UAS in a dry environment with an ambient temperature of 0 and 23°C and humidity of about 45%.

14. References

Ref	Doc Number	Description
1	BH1-SYS-UOM	Beehive 1 Operations Manual
2	BH1-SYS-UMM	Beehive 1 Maintenance Manual
3	BH1-SYS-UFM	Beehive 1 Flight Planning Manual

15. Acronyms/Terms

Acronym	Description
Bee	The Unmanned Aircraft (UA)
BVLOS	Beyond Visual Line of Sight
C3 Link	Command, Control and Communication Link
Caution	means if the precaution is not taken, it may cause minor or moderate injury or damage.
CS	Control Station (the web app)
DAS	Detect and Avoid System
DHCP	Dynamic Host Configuration Protocol
ERP	Emergency response Plan
GPS	Global Positioning System
GS	Ground Station (the Hive)
GUI	Graphical User Interface
Hive	The Ground Station (GS)
ID	Identification
LED	Light Emitting Diode
OCF	Operational Checkout Flight
Operator	Person or organization that is registered and is responsible for the operation
Orthomosaic	Top-down high-resolution image of the property showing in the 2D map

RF	Radio Frequency
RPIC	Remote pilot in command
TFR	Temporary Flight Restrictions
UA	Unmanned Aircraft (the Bee)
UAS	Unmanned Aircraft System
UIM	Unmanned Aircraft System Installation Manual
UMM	Unmanned Aircraft System Maintenance Manual
UOM	Unmanned Aircraft System Operations Manual
UPS	Uninterruptible Power Supply/Source
URI	Uniform Resource Identifier
Visual Observer	Person who assists the Remote Pilot by performing unaided visual scanning of the airspace for any potential hazard in the air
VLOS	Visual Line Of Sight. UAS Operation in which the Remote Pilot is able to maintain continuous unaided visual contact with the Bee
VO	Visual Observer
Warning	means if the warning is not heeded, it can cause death or serious injury.

16. Record of Revisions

Rev	Date	Change Description
A	3 Mar 2025	Initial release.