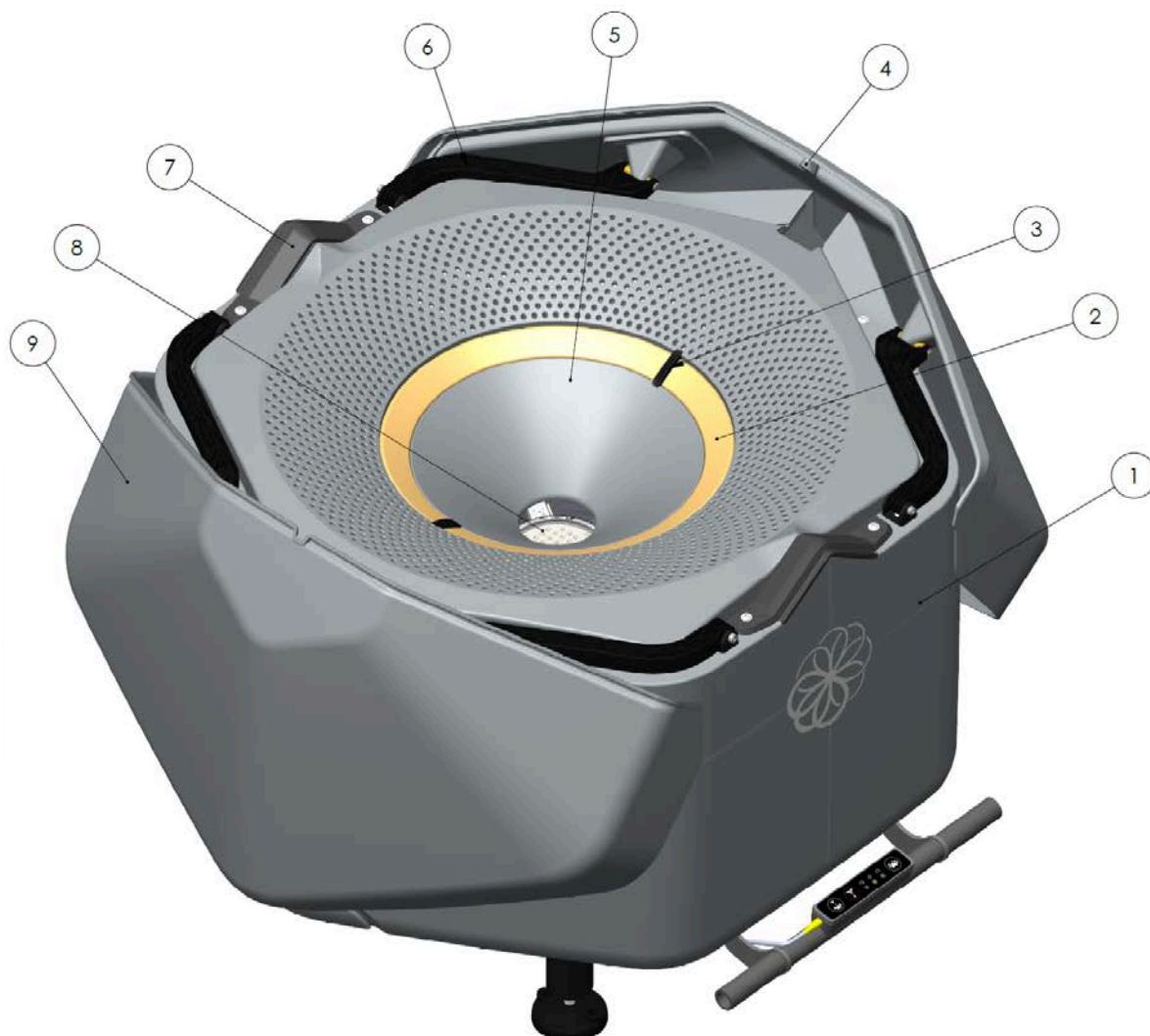




Maintenance Manual

Beehive 1

BH1-SYS-UMM / Rev B

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1. Introduction

This maintenance manual contains the instructions for continued airworthiness for the Sunflower Labs Beehive 1 UAS.

This maintenance manual provides the operator of the UAS with the inspection schedule, maintenance procedures and includes a maintenance log.

The prescribed maintenance tasks need to be completed at regular intervals or on-condition, as appropriate.

The maintenance procedures contain instructions about how to perform maintenance on the ground station (GS), called the Hive, and on the unmanned aircraft (UA), called the Bee.

2. General Information

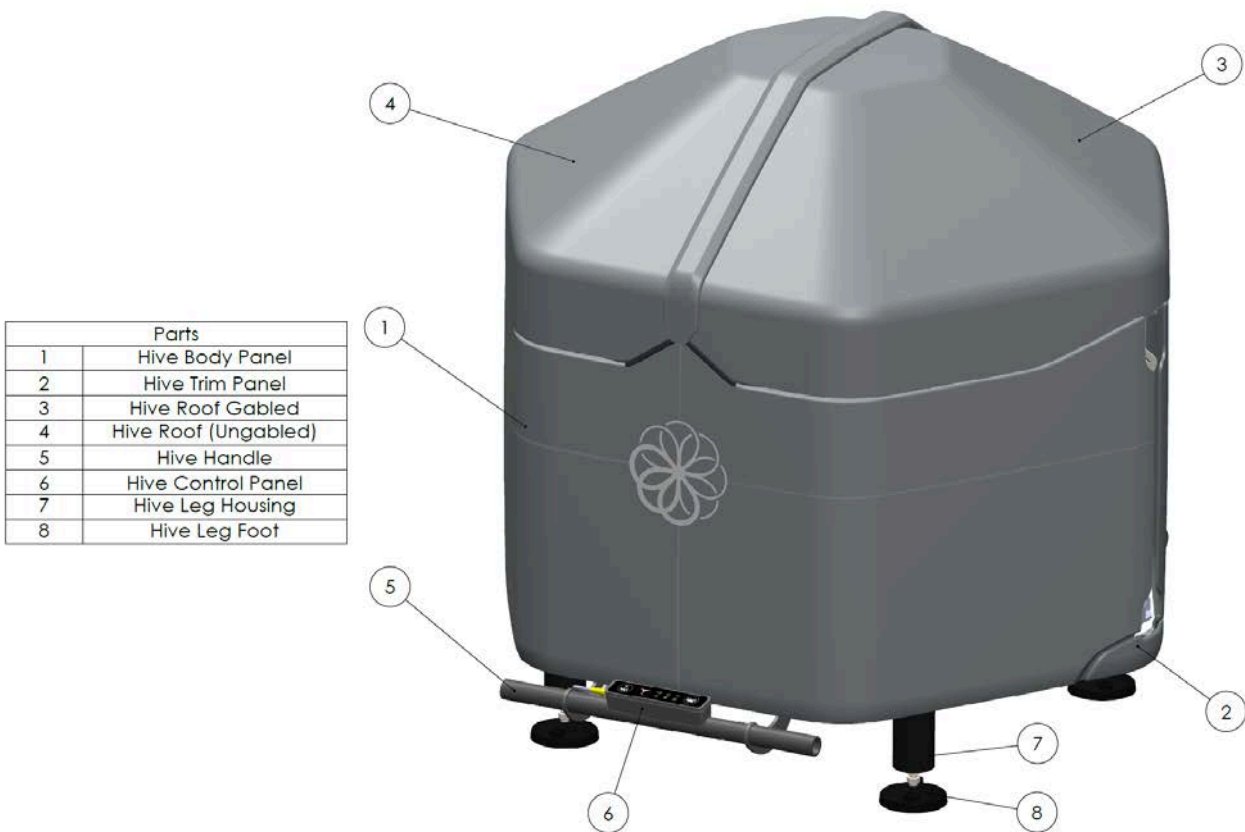
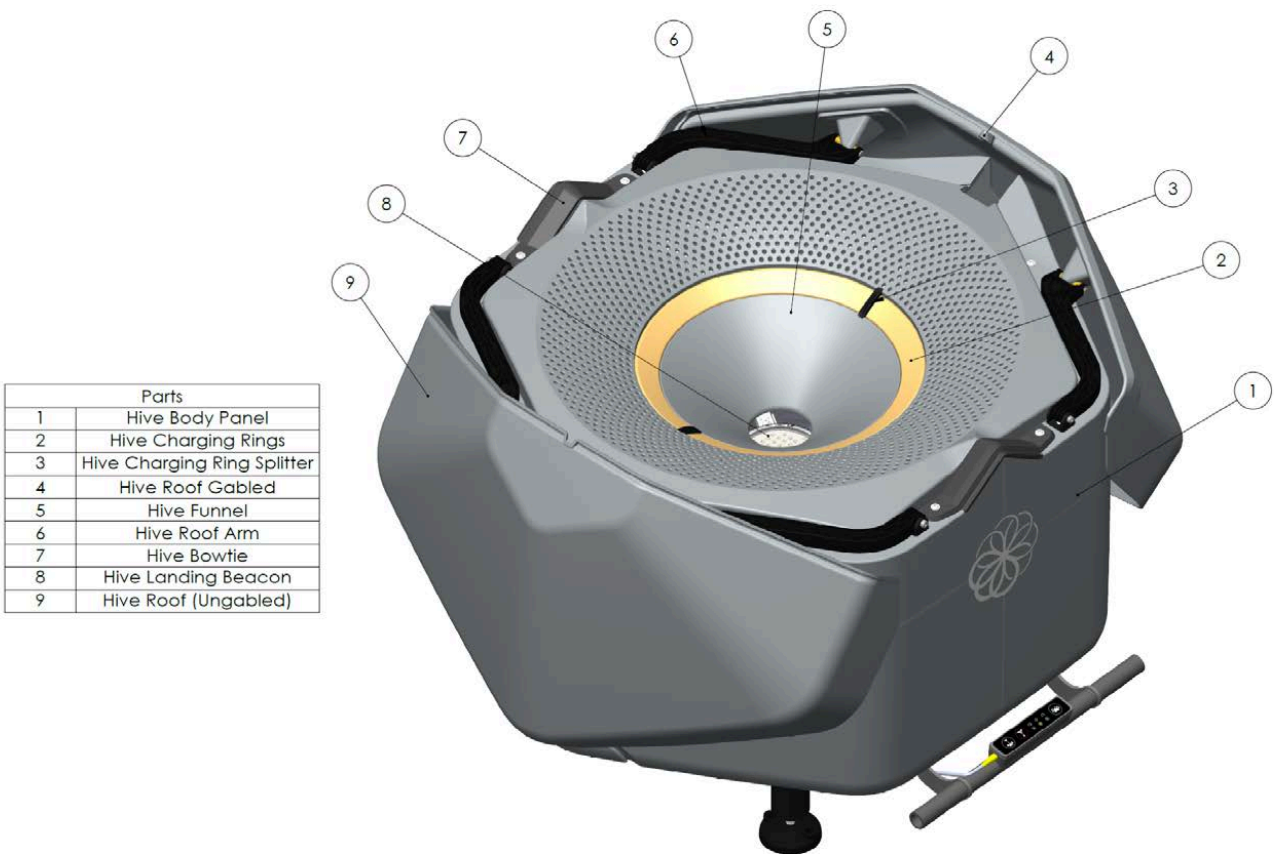
2.1. Scheduled (Preventive) Inspection and Maintenance

This section of the document provides a complete list of scheduled maintenance requirements (inspection and cleaning procedures) to be carried out during the entire life-time of the system, in order to ensure that its condition is fit for safe operation.

The tables in sections 2.1.1 and 2.1.2 provide an overview of all the maintenance required on the system, an indication whether the maintenance step is safety critical and an overview of the time interval the maintenance step is required to be performed at.

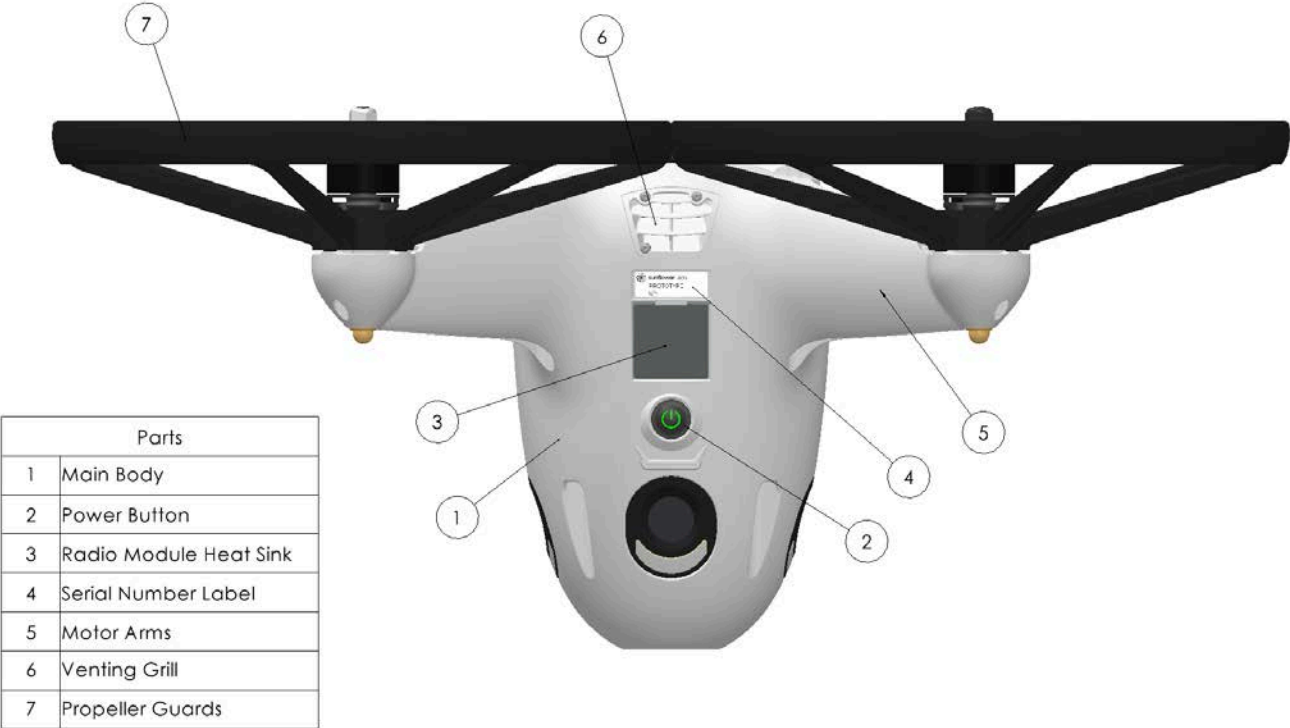
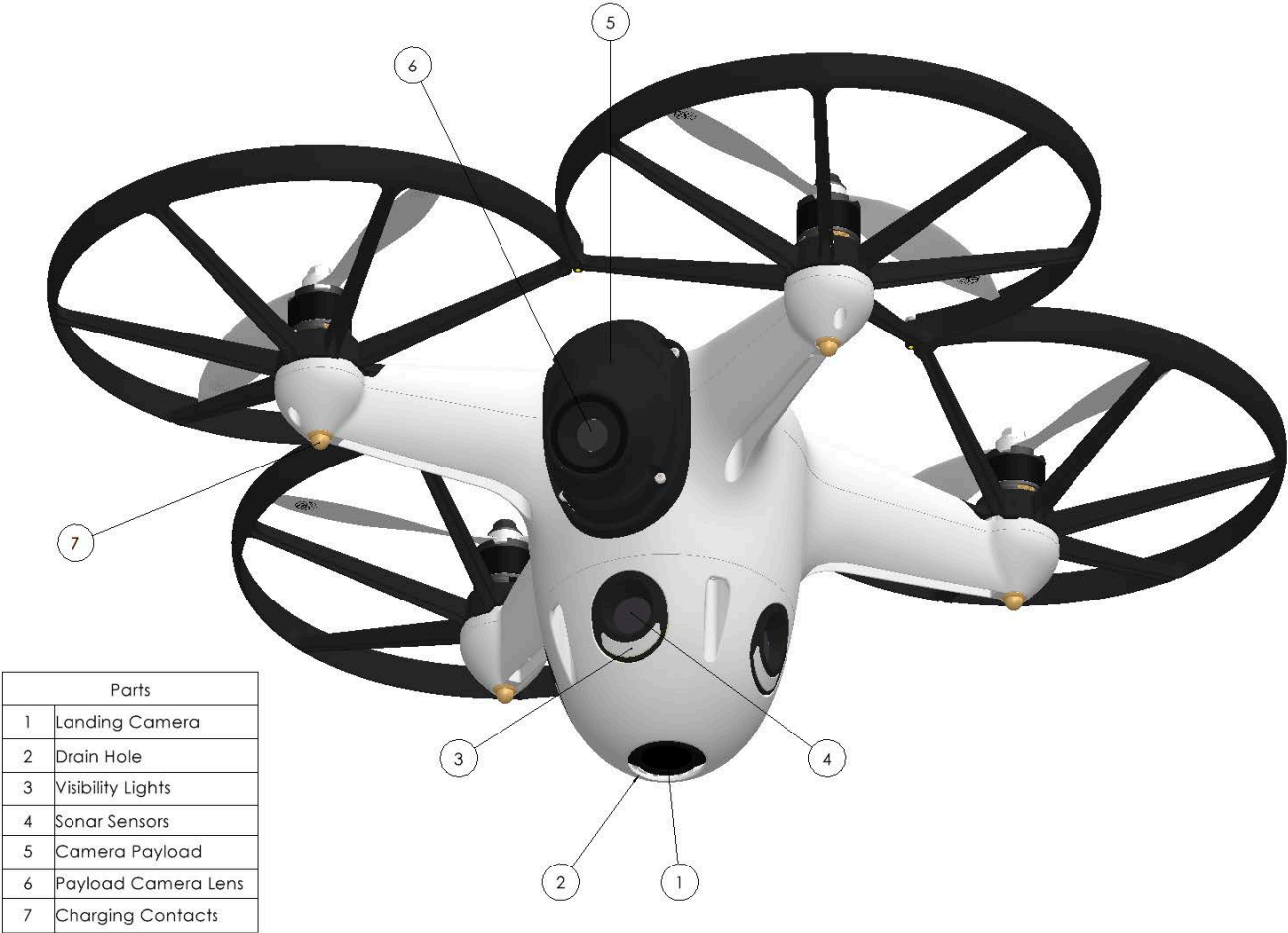
As stated in section 2.1.3 and 2.1.4 below, the CS will help the operator keep track of the maintenance due dates and provides a built-in maintenance checklist to support the operator while performing the maintenance.

2.1.1. The Hive



Item	Category	Task	Interval	Task Description
1	Non-Safety	GVI	As required	General Visual Inspection of the control panel. Ref: Section 3.1.2
2	Non-Safety	CLN	As required	Clean the control panel. Ref: Section 3.1.3
3	Safety	GVI	3MO	General Visual Inspection of the power supply / network cables. Ref: Section 3.1.4
4	Safety	CLN	3MO	Clean the power supply / network cables. Ref: Section 3.1.5
5	Non-Safety	GVI	As desired	General Visual Inspection of the Hive outside. Ref: Section 3.1.6
6	Non-Safety	CLN	As required	Clean the outside of the Hive. Ref: Section 3.1.7
7	Non-Safety	GVI	As desired	General Visual Inspection of the roof assembly. Ref: Section 3.1.8
8	Non-Safety	CLN	As required	Clean the inside of the roof assembly. Ref: Section 3.1.9
9	Non-Safety	GVI	As required	General Visual Inspection of the landing funnel / charging rings. Ref: Section 3.1.10
10	Non-Safety	CLN	As required	Clean the landing funnel / charging rings. Ref: Section 3.1.11
11	Safety	GVI	3MO	General Visual Inspection of the landing beacon. Ref: Section 3.1.12 (to be added)
12	Safety	CLN	3MO	Clean the landing beacon. Ref: Section 3.1.13

2.1.2. The Bee





Item	Category	Task	Interval	Task Description
1	Safety	GVI	3MO	General Visual Inspection of the propellers (4) and propeller guards (4). Ref: Section 3.2.2
2	Safety	CLN	3MO	Clean the propellers (4) and propeller guards (4). Ref: Section 3.2.3
3	Safety	GVI	3MO	General Visual Inspection of the propeller drive motors (4) and motor mounts (4). Ref: Section 3.2.4
4	Safety	CLN	3MO	Clean the propeller drive motors. Ref: Section 3.2.5
5	Safety	GVI	3MO	General Visual Inspection of the anti-collision light

Item	Category	Task	Interval	Task Description
				Ref. Section 3.2.6
6	Safety	CLN	3MO	Clean the anti-collision light Ref. Section 3.2.7
7	Safety	GVI	3MO	General Visual Inspection of the Bee Body and Motor Arms Ref. Section 3.2.8
8	Safety	CLN	3MO	Clean the Bee Body and Motor Arms Ref. Section 3.2.9
9	Non-Safety	GVI	As required	General Visual Inspection of the charging contacts. Ref: Section 3.2.10
10	Non-Safety	CLN	As required	Clean the charging contacts. Ref: Section 3.2.11
11	Non-Safety	GVI	As required	General Visual Inspection of the venting grill. Ref: Section 3.2.12
12	Non-Safety	CLN	As required	Clean the venting grill. Ref: Section 3.2.13
13	Non-Safety	GVI	As required	General Visual Inspection of the radio module heatsink. Ref: Section 3.2.14
14	Non-Safety	CLN	As required	Clean the radio module heatsink. Ref: Section 3.2.15
15	Safety	GVI	3MO	General Visual Inspection of the power button. Ref: Section 3.2.16
16	Non-Safety	CLN	As required	Clean the power button. Ref: Section 3.2.17
17	Non-Safety	DVI	As required	Inspect (Detailed) the condition of the payload camera lens. Ref: Section 3.2.18
18	Non-Safety	CLN	As required	Clean the payload protective glass cover. Ref: Section 3.2.19

Item	Category	Task	Interval	Task Description
19	Safety	GVI	3MO	General Visual Inspection of the sonar sensors. Ref: Section 3.2.20
20	Safety	CLN	3MO	Clean the sonar sensors. Ref: Section 3.2.21
21	Non-Safety	GVI	3MO	General Visual Inspection of the visibility lights Ref. Section 3.2.22
22	Non-Safety	CLN	As required	Clean the visibility lights Ref. Section 3.2.23
23	Safety	DVI	3MO	Inspect (Detailed) the condition of the landing camera lens. Ref: Section 3.2.24
24	Safety	CLN	3MO	Clean the landing camera protective glass cover. Ref: Section 3.2.25
25	Non-Safety	GVI	As required	General Visual Inspection of the venting holes. Ref: Section 3.2.26
26	Non-Safety	CLN	As required	Clean the venting holes. Ref: Section 3.2.27
27	Non-Safety	OPC	3MO	Operational Check of the Ventilation Fan Ref. Section 4.1
28	Non-Safety	OPC	3MO	Operational Check of the Visibility Lights Ref. Section 4.2
29	Safety	OPC	3MO	Operational Check of the Anti-Collision Light Ref. Section 4.3
30	Non-Safety	OPC	3MO	Operational Check of the Remote ID module Ref. Section 4.4
31	Safety	OPC	3MO	Operational Checkout Flight Ref. Section 4.5

2.1.3. Maintenance Status in the CS

The CS supports the operator in keeping track of the maintenance status. The status bar in the CS displays the current status of the maintenance.

The status of the maintenance can be:

- No maintenance required.
 - There is no reference to the Maintenance in the status bar
- Maintenance is required soon.
 - Status bar shows the message:
- Maintenance is past due.
 - Status bar shows the message:

Maintenance Required Soon

Maintenance Required

Note: If maintenance is overdue, the system will remain locked until the required maintenance is completed.

2.1.4. Maintenance Checklist in the CS

The CS has a specific Maintenance section that helps the operator go through the maintenance tasks and offers a maintenance checklist.

To access this page, click on Settings and select the Maintenance tab.

The page shows the Maintenance Status, the last time the system went through the maintenance procedure and the next due date for the maintenance.

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
----------------------	----------------

Below the Maintenance status, there is a checklist that the operator has to complete while going through the Maintenance tasks listed in this manual. The checklist serves both as record keeping and track keeping.

Once all the tasks are completed and checked, the operator clicks **Log Completed Maintenance** and the maintenance status will update accordingly.

Log Completed Maintenance

Log Completion

Once the maintenance tasks have been completed, click the button to make a log entry. If you observed any problems, please contact support.

Log Completed Maintenance

🔗 Contact support

In case any problems were observed during maintenance, click on **Contact Support** or go directly to <https://app.sunflower-labs.com/maintenance-report>.

🔗 **Contact Support**

2.2. Unscheduled Inspection and Maintenance

This section contains the maintenance checks and inspections on the UAS, its systems and units which are recognized by the UAS manufacturer as special or unusual conditions and are not related to the time limits specified in the Scheduled and Preventive Inspection and Maintenance section of this document (Section [2.1](#)).

Unscheduled checks must be performed after the following incidents occur or permitted deviations are exceeded.

2.2.1. Hard Landing (in- or outside of the Hive)

Title: Hard landing (in- or outside of the Hive) Concerns: • Structural damage of critical parts • Performance degradation due to damage to non-critical parts	
If hard landing is suspected (based on visual cues provided by the payload camera) the following examination shall be carried out before further flight. An initial examination consists of determining if any external damage has occurred. If no objectionable damage is found during the initial examination the system can be placed back to operation after an operational checkout flight.	
Hard landing occurs outside of the Hive	• Perform GVI of all critical and non-critical parts of the Bee in accordance with section 3.2. If GVI of all critical parts is passed • Perform operational checkout flight in accordance with 4.5
Hard landing during landing phase of operation and collision with the Hive occurs	• Perform GVI of all critical and non-critical parts of the Bee in accordance with section 5.2. • Perform GVI of the landing beacon, roof assembly and the landing funnel / charging rings of the Hive in accordance with section 3.1. If GVI of all critical parts is passed • Perform operational checkout flight in accordance with 4.5

2.2.2. Severe Weather Conditions (heavy rain, slush, snow, sand storm and hail strike)

Title: Severe weather conditions (heavy rain, slush, snow, sand storm and hail strike)	
Concerns: • Water/snow/slush ingress • Structural damage of critical parts • Performance degradation due to damage to non-critical parts	
The Bee is fitted with venting holes which allow it to drain any kind of liquid present inside the Bee. Furthermore the Bee is equipped with a fan providing ventilation (stable positive air-flow) which accelerates the removal of any kind of liquid on the Bee internal wall or humidity that may penetrate into or become trapped inside the Bee. In order to verify how much water has been ingested into the Bee during the event flight, carry out the inspection “Landing outside of the Hive (water or wet surface)” section 2.2.4. If the venting holes and the ventilation grill are not blocked and the ventilation fan operates normally then sufficient assurance is present for confirming that no dangerous amount of water is accumulated inside the Bee that might be detrimental to the overall system operation and performance. If water/snow/slush ingestion is suspected during normal operation, e.g. after flight under heavy raining/snowing conditions, perform an examination of the venting holes, the ventilation system outlet and verify the proper functioning of the ventilation fan. If the venting holes and the ventilation system air outlet are not blocked and the ventilation fan is functioning then, once the initial examination was successfully completed, the system can be placed back to operation after an operational check. After a flight in a sand storm or hail strike the initial inspection shall examine each component of the Bee in order to ensure that no safety or performance degradation is caused by the event. Once the initial examination is successfully completed the system can be placed back to operation after an operational check.	
Water/snow/slush ingress suspected	• Perform GVI’s applicable to the inspection pertinent to the “Landing outside of the Hive (water or wet surface)” event. See 2.2.4 for details. • Perform GVI of the venting holes located in the Bee i.a.w. Section 3.2.26. • Perform GVI of the ventilation system air outlet and grill i.a.w. Section 3.2.12. • Perform operational check of the ventilation fan in accordance with section 4.1. If all three GVI’s and the operational check of the ventilation fan are passed • Perform operational checkout flight in accordance with section 4.5.
Sand storm or hail strike	• Perform GVI of all critical and non-critical parts of the Bee in accordance with section 3.2. • Perform GVI of the following components of the Hive: ◦ Landing beacon i.a.w. section 3.1.12

Title: Concerns:	Severe weather conditions (heavy rain, slush, snow, sand storm and hail strike) • Water/snow/slush ingress • Structural damage of critical parts • Performance degradation due to damage to non-critical parts
	○ Roof assembly i.a.w. section 3.1.8 ○ Control panel i.a.w. section 3.1.2 ○ Landing funnel /charging rings i.a.w. section 3.1.10 ○ Power supply / network cables i.a.w. section 3.1.4 • Perform operational check of the ventilation fan in accordance with section 4.1. If both GVI's and the operational check of the ventilation fan are passed • Perform operational checkout flight in accordance with section 4.5.

2.2.3. High Vibration

Title: High vibration	
Concerns: Potential structural disintegration of vehicle	
The Bee is equipped with a vibration monitoring system that detects and indicates any vibration that might adversely influence the performance characteristics and potentially the safe operation of the Bee. In case a high vibration level is detected, the vibration monitoring system alerts the Bee pilot through the CS and the Bee will perform an automatic return to land procedure. High vehicle vibration is most likely to be caused by propeller, propeller guard, or propeller drive motor failure/damage. Damage to these external components can be detected via an inspection and rectified by the operator. Internal failures can lead to unacceptable vehicle vibrations as well, however those require shop level troubleshooting and repair and therefore are completed by the OEM. In order to identify the root cause of a high vibration level condition, perform the examination of the propellers, propeller guards and propeller drive motors. Once the faulty component is identified and replaced the system shall go through an operational check and return to service provided the test is successfully passed.	
High vibration level	- Perform GVI of the propellers and propeller guards i.a.w. section 3.2.2. - Perform GVI of the propeller drive motors and motor mounts i.a.w. section 3.2.4. If both GVI's are passed - Perform operational checkout flight in accordance with 4.5. Pay particular attention to the vibration levels and make sure no vibration warnings come on during the flight.

2.2.4. Landing Outside of the Hive

Title: Landing outside of the Hive (landing with nominal descent rate - no crash land)

Concerns:

- Water ingress
- Structural damage to plastics, propellers, propeller guards, etc.

After a landing in water the following examination shall be carried out before further flights.

Once the Bee is recovered from the water, the operator shall first turn off the unit by pressing the power switch on the side of the aircraft if the status power light is on.

An initial examination shall be conducted in order to get a good understanding of how much water has been ingested into the Bee. This can be done by judging from the amount of water leaving the Bee while draining it.

In order to drain the water ingested, the aircraft shall be kept in its normal flying orientation and allow the water to leave the aircraft through the venting holes.

Once all water has left the Bee, place it into a warm environment oriented upside down and allow it to dry for a couple of days depending on the amount of water ingested.

At the end of the drying process, turn on the Bee and have the ventilation fan running. Let the unit operating and the ventilation fan run for an hour in order to remove the residual moisture from inside the vehicle.

After the vehicle has been completely dried out, the system can be placed back to operation after an operational checkout flight.

Caution: Do not attempt to dry the Bee yourself with an external heating source such as a hair dryer.

	Water Landing: • Obtain a good understanding of how much water has been ingested into the Bee by carefully shaking it along the horizontal plane while holding the Bee in its normal flight orientation (propellers up). • Drain the water trapped inside the vehicle by holding the Bee in its normal flight orientation (propellers up) and letting water leave the aircraft through the venting holes located on the motor arms and on the bottom cowling. • Keep the Bee at a warm location for a couple of hours, placed on a horizontal surface with the landing camera pointing up and allow the moisture still inside the unit to evaporate. • Make an attempt to power up the device. If successful, leave the unit operating and the ventilation fan running for an hour to remove the residual moisture still remaining inside the vehicle. (If the attempt for powering up the Bee is unsuccessful, return the unit to the OEM for repair). Once the above steps are completed, - Perform an operational checkout flight in accordance with 4.5. Dry surface landing (concrete, grass, gravel, etc.): Perform the inspection described in section 2.2.1. Hard landing (in- or outside of the Hive) - Perform an operational checkout flight in accordance with 4.5.
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2.2.5. Battery Damage

Title: Battery damage

Concerns:

- Injury to operating personnel
- Potential fire (vehicle or surrounding infrastructure)

The Bee is equipped with a Lithium Polymer battery which is capable of storing a large amount of energy. The battery is mounted inside the Bee in a manner that prevents the battery being damaged during normal handling and operation.

In an unlikely case, if the battery becomes damaged, there are two main concerns:

- The battery might have an internal short circuit or charging control anomalies which can lead to battery overheating or fire.
- Battery leak

If battery leak or overheat is suspected, wear nitrile, neoprene, or natural rubber gloves and safety glasses when handling an open or leaking battery.

Safety Precautions:

- Contents of an opened battery can cause skin irritation.
Wash skin with soap and water.
- Contents of an opened battery can cause eye irritation.
Immediately flush eyes thoroughly with water for 15 minutes and seek medical attention
- Leave the room immediately if there is an intensive smoke build-up or release of gas.
Seek advice from a medical doctor if there are large quantities and irritation of the respiratory tract. If possible provide for sufficient ventilation.

Once the battery failure is confirmed, the first safety steps are completed and there are no signs of battery overheating or fire:

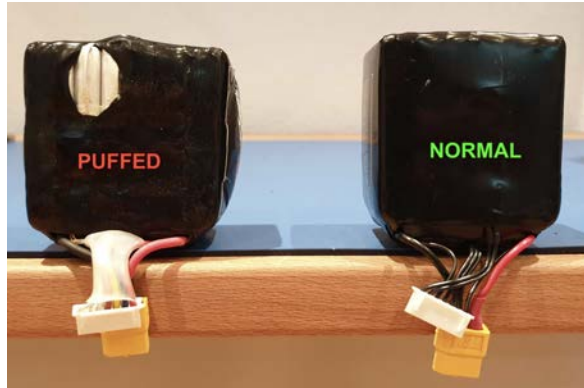
- remove the payload camera of the Bee and get access to the battery.
- Disconnect the electrical cables from the damaged battery and remove the fasteners securing the battery in its mounting location.
- Remove the bottom cowling and then the battery and discard it following the local regulations in regards to the recycling of Lithium Ion batteries.
- Reinstall the payload camera and the bottom cowling and return the Bee to the OEM.

Title: Battery damage

Concerns:

- Injury to operating personnel
- Potential fire (vehicle or surrounding infrastructure)

Inflated battery (puffed)



- Obey all safety precautions specified in this section
- Remove the damaged battery
- Inspect the vehicle structure and internal electronics for signs of damage
- Install a new battery
- Perform an operational checkout flight in accordance with [4.5](#).

Title: Concerns:	Battery damage • Injury to operating personnel • Potential fire (vehicle or surrounding infrastructure)
Overheat or fire	• In case a battery overheat is detected (CS warning), turn off the Bee and place it at a location where the propagation of a potential fire originating from the Bee is eliminated. • Wait and periodically check the surface temperature of the vehicle body structure in the area of the battery using a remote (laser based) surface temperature measurement device (commercially available). • If the temperature is increasing, then keep a safe distance from the Bee and prepare for fighting Lithium battery fire. • If the temperature is decreasing, then wait until the temperature reaches the ambient temperature level (or just above). • Obey all safety precautions specified in this section • Remove the electrolyte escaping the battery from the vehicle as described above • Remove the damaged battery i.a.w section 5.3.1 and safely dispose of it according to local laws. • Inspect the vehicle structure and internal electronics for signs of damage • Install a new battery i.a.w section 5.3.2.. • Perform an operational checkout flight of the system in accordance with 4.5.

2.2.6. Collision with other Aircraft or Ground Infrastructure

Title: Collision with other aircraft or ground infrastructure	
Concerns: • Structural damage of critical parts • Performance degradation due to damage to non-critical parts	
Caution: <i>These kinds of events shall be reported to the local aviation authority and the manufacturer¹.</i>	
After a collision with another aircraft or man-built object, the following examination shall be carried out before further flight. An initial examination consists of determining if any external damage has occurred. If no objectionable damage is found during the initial examination the system can be placed back to operation after an operational checkout flight.	
Collision with other aircraft or ground infrastructure	• Perform GVI of all critical and non-critical parts of the Bee in accordance with section 3.2. If GVI of all critical parts is passed • Perform operational checkout flight in accordance with 4.5.

¹ Refer to [Section 9](#)

2.3. Troubleshooting

A comprehensive troubleshooting guidance with the associated procedures is provided in the Unmanned Aircraft System Operations Manual (UOM).

Note: In case the system exhibits any abnormal behavior, the operator is permitted to perform a basic set of troubleshooting steps in accordance with the instructions provided in the Unmanned Aircraft System Operations Manual (UOM). It is strictly prohibited to make any attempt to rectify system malfunctions beyond the coverage of the troubleshooting information provided in the UOM.

2.4. Qualifications for Carrying Out Maintenance

The system is designed to operate with minimum required maintenance (inspections and servicing). Nevertheless certain inspection and servicing tasks shall be carried out by the operator when applicable and instructed so.

The inspection and servicing procedures and instructions are designed in a manner that they allow to be carried out by personnel with no special technical training, education, skills, experience or competence.

Note: The maintenance tasks are designed to be non-demanding and carried out by personnel with limited technical knowledge or skills. If in doubt the Operator shall seek professional assistance for carrying out the maintenance tasks (inspection, cleaning, tests and troubleshooting procedure).

2.5. Quality Control

The generation of the life cycle data related to the maintenance (inspections, servicing, cleaning, repair, overhaul, testing, troubleshooting and system upgrades) are covered under the quality management processes of the UAS manufacturer.

The maintenance tasks required from the operator side are very simple and require no special training, education, experience or skills therefore during their accomplishment no independent checking or inspection of the completed maintenance task is deemed necessary.

Nevertheless in order to provide auditable evidence of the accomplishment of the required periodic or unscheduled (special) maintenance activities the operator is required to record the completion of the appropriate maintenance tasks in the maintenance log, and the safety concerns and occurrences should be reported.

To report safety concerns and/or occurrences related to maintenance and quality control to Sunflower Labs use the Manufacturer Occurrence Reporting Form in [Section 9](#).

Note: The accomplishment of the periodic and unscheduled (special) maintenance tasks shall be recorded in the maintenance log.

2.6. Component List and Specifications

The operator is permitted to replace some components that are classified as a line replaceable unit, and therefore a suitable removal/installation and testing procedure is provided within this system maintenance manual.

The following components may be replaced by the operator:

Item	Description	Quantity	Part Number
1	Bee (UA)	1	130-1003
1.a	• Battery	1	555-1001
1.b	• Propeller, CW rotating	2	488-1003
1.c	• Propeller, CCW rotating	2	488-1004
1.e	• Camera, Payload	1	400-1055

Note: The operator is permitted to replace the components (and only those components) in the above table and place the overall system back to service after performing the pertinent operational check specified in this manual.

2.7. Software Release Notes

All software changes in the product are communicated to the customer through the release notes available on the Sunflower Labs website.

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

Release notes may contain:

- Version number
- New functionality
- Fixes and improvements

2.8. Ground Handling

The system requires no special ground handling procedure. If the Unmanned Aircraft is removed from the Hive, it shall be handled by its motor arms and shall be placed on a horizontal surface upside down (with the propellers at the bottom and the landing camera facing upward).

Caution: Although the Unmanned Aircraft is a robust design, handle it with care. Do not hold and lift the Bee by the propeller guards or propellers!





2.9. List of Tools and Instruments

Caution: Tools used during assembly should not be magnetized, in order to prevent residual magnetisation of any fasteners or other parts.

The following tools and equipment is required to perform all of the maintenance tasks in this maintenance manual:

- Cotton cloth (do **NOT** use a microfiber cloth)
- Cleaning liquid (soft, non-aggressive) and/or isopropyl alcohol
- Compressed air
- Protective gloves
- Small brush (soft bristles)
- M10 socket head torque driver (2.5 Nm)
- TX8 torque screwdriver (0.5 Nm)
- Camera to take pictures of any problems (phone camera is fine)

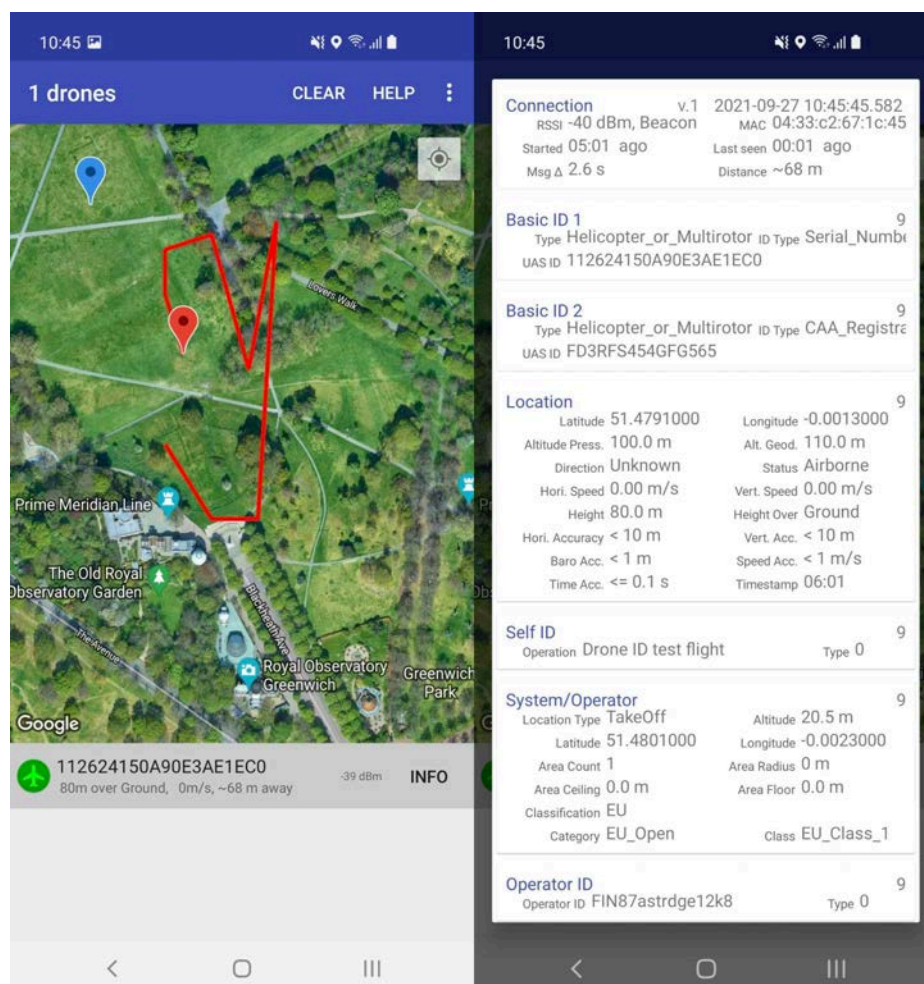
2.9.1. Remote ID Tracker App

The operational check [4.4](#) requires the use of a Remote ID tracker app.

To download the app, go to the phone application store (e.g. App Store for iOS) and download a Remote ID tracker app.

Suggested apps:

- Drone Scanner (Android and iOS)
- OpenDroneID OSM (Android only)



Example of Remote ID tracker app (OpenDroneID OSM)

3. Inspection and Cleaning Procedures

This section provides the detailed procedures for the Maintenance Inspection Items identified in Sections [2.1.1](#) and [2.1.2](#).

3.1. Hive

This section provides the detailed procedures for the Hive Maintenance Inspection Items identified in Sections [2.1.1](#).

3.1.1. Instructions for performing the General Visual Inspection of the Hive

The Hive contains safety critical parts and non-critical parts. If any damage is observed on any of the critical parts, do not fly the UAS again before the damage is fixed.

Hive Critical Parts	Hive Non-Critical Parts
• Power Supply • Landing Beacon	• Control Panel • Body Panels • Roof Assembly • Landing Funnel • Charging Rings

During the GVI look for signs of damage, cracks, scratches, or dirt blocking cooling holes.

The following are examples of critical findings, which require corrective action by either the UAS operator or the OEM:

- Crack(s) or any sign of damage on the landing beacon
- Crack(s) or any sign of damage on the power supply cables

The following are examples of non-critical findings, which might impair optimum system performance but with no or negligible effect on the safe operation of the UAS:

- Scratches on the Hive body panels
- Damage to the charging rings
- Short and/or shallow (minor/insignificant) scratches on the control panel

In case of critical finding the damaged component shall be replaced with a new one by the operator if an applicable repair procedure is provided in Section 7 of this document, or alternatively the UAS returned to the OEM for repair.

In case of non-critical finding the replacement of the damaged part is up to the discretion of the operator. The system might not deliver the specified performance with the Bee operating with those degradations.

The potential degradation of Bee performance are (but not limited to):

- Prolonged charging times
- Bee not charging at all upon landing

3.1.2. Inspection - General Visual Inspection (GVI) of the Control Panel

1. Pull out the Hive handles from under the Hive



- 2.
- Make sure the panel with the buttons is fully seated and that its glue is not failing.

HW version 0.9 and earlier:



HW version 0.10 and later:



- Check that the mounting screws on the back side of the handle tube are still fully fastened.



- Inspect the cable of the control panel for visible damage.

3. If needed, clean the control panel in accordance with the instructions in the next section.

3.1.3. Cleaning - Cleaning (CLN) of the Control Panel

1. Pull out the Hive handles from under the Hive



2. Use a wet cotton cloth (do **NOT** use microfiber cloths) to clean the Control Panel surfaces. Use soft non-aggressive soap for persistent debris.

3.1.4. Inspection - General Visual Inspection (GVI) of the Power Supply and Network Cables

1.	Check the cable connection where the Beehive System 1 is plugged into the power and networking grid.
2.	Follow the power and network cables from the grid connections and check for any damage to the cables along the cables.
3.	Check the cable connections underneath the Hive at Brood Box. HW version 0.9 and earlier:  HW version 0.10 and later: 
4.	If needed, clean the power supply and network cables in accordance with the instructions in the next section.

3.1.5. Cleaning - Cleaning (CLN) of the Power Supply and Network Cables

Caution: Make sure to keep the connectors dry!

1.	Unplug both sides of the dirty cable (power cable, network cable)
2.	Use compressed air to remove any debris from the connectors.
3.	Use a wet cotton cloth (do NOT use microfiber cloths) to clean the cables. Use soft non-aggressive soap for persistent debris.
4.	Make sure the connectors of the cables are still dry, then re-plug the cables to the Brood Box and then to the grid.

3.1.6. Inspection - General Visual Inspection (GVI) of the Hive Outside

1.	Inspect the outside surfaces of the 2 roof parts for cracks.
2.	Inspect the outside surfaces of the 2 side panels for cracks.
3.	Inspect 2 small connecting panels and ensure they are engaged fully.
4.	If needed, clean the outside of the Hive in accordance with the instructions in the next section.

3.1.7. Cleaning - Cleaning (CLN) of the Hive Outside

1.	Use a wet cotton cloth (do NOT use microfiber cloths) to clean the outer roof surfaces and side panels. Use soft non-aggressive soap for persistent debris and rinse the roof and side surfaces with clean water after (roof must be closed!).
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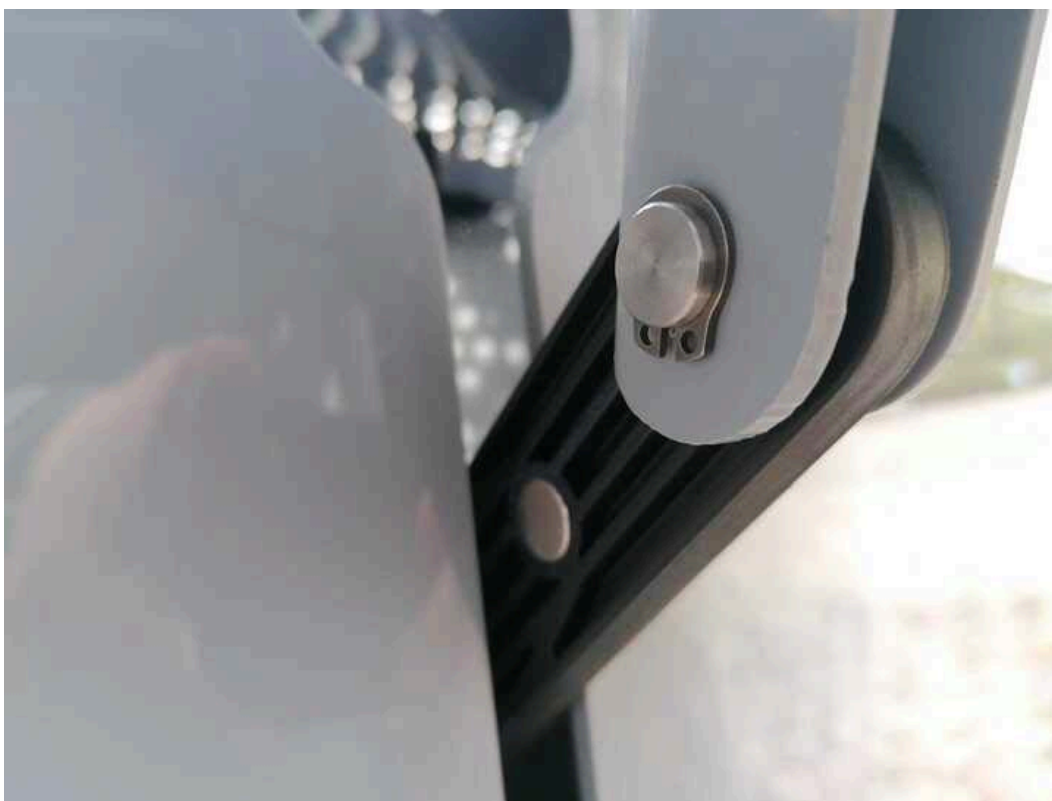
3.1.8. Inspection - General Visual Inspection (GVI) of the Roof Assembly

1.	Open the roof half way (pause the roof when in the halfway position)
2.	Inspect the outside surfaces of the 2 roof parts for cracks.
3.	Wiggle the roof sides to see if the mounting points are still fully fastened (there should be no rattling sound coming from the roof when doing this) 
4.	Inspect the inner sides of the 2 roof sides for cracks.
5.	Make sure the shoulder screws at the mounting points of the roof arms are still fully fastened and are not loose. 

6. Inspect the pins at the top end of the roof arms and check if all the retaining rings are still in place.



7. Inspect the center mounting points to the conrod from the outside and check if the c-clip is still fully fastened.



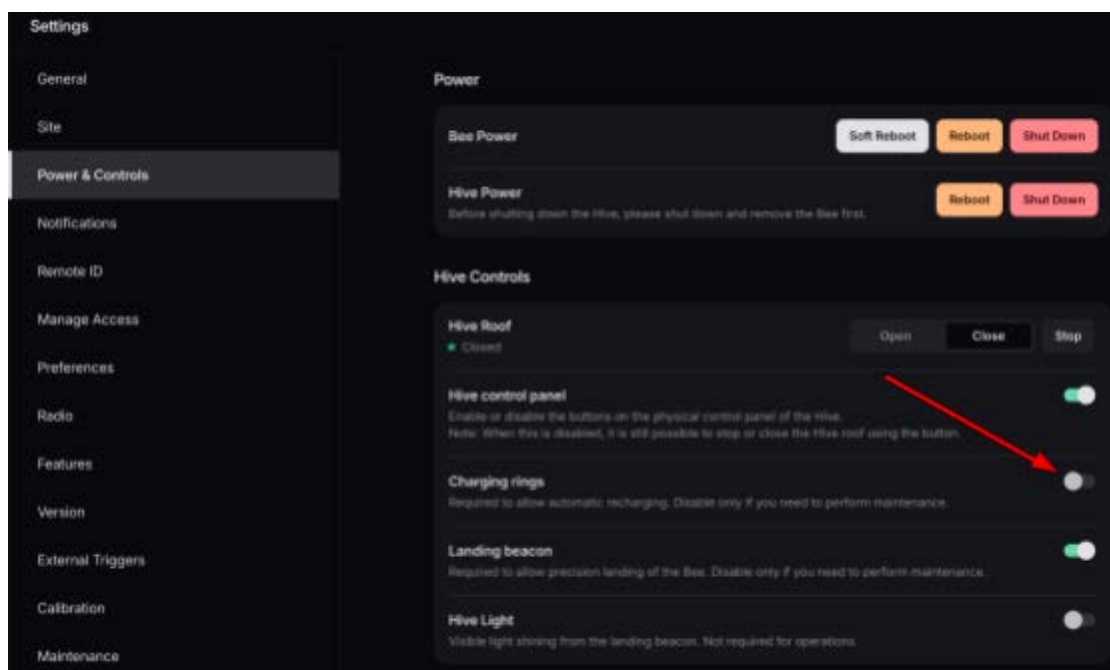
8. If needed, clean the roof assembly in accordance with the instructions in the next section.

3.1.9. Cleaning - Cleaning (CLN) of the Roof Assembly

1. Use a wet cotton cloth (do NOT use microfiber cloths) to clean the inner roof surfaces and roof arms. Use soft non-aggressive soap for persistent debris and rinse with clean water after.

Caution: Before performing any of the tasks below, turn off the charging rings on the Hive and remove the Bee from the Hive and turn it off.

- Go to **Settings** → **Power&Controls**. Toggle the **Charging rings** switch to its off position.



- Remove the Bee from the Hive
- Turn off the Bee by pressing and holding its power button
- Carefully place the Bee upside down on a flat surface.

3.1.10. Inspection - General Visual Inspection (GVI) of the Landing Funnel and Charging Rings

1.	Open the roof of the Hive all the way.
2.	Turn off the charging rings and remove Bee from the Hive (if applicable).
3.	Check for cracks in the material.
4.	Check for any debris in the funnel.
5.	Inspect the Charging Rings for corrosion, excessive scratches or other damage.
6.	If needed, clean the landing funnel and charging rings in accordance with the instructions in the next section.

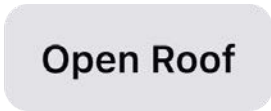
3.1.11. Cleaning - Cleaning (CLN) of the Landing Funnel and Charging Rings

1.	Open the roof of the Hive.
2.	Turn off the charging rings and remove Bee from the Hive (if applicable).
3.	Use compressed air to remove any debris in the holes of the funnel.
4.	Use a wet cotton cloth (do NOT use microfiber cloths) to clean the Funnel and Charging Rings surfaces. Use soft non-aggressive soap for persistent debris.

3.1.12. Inspection - General Visual Inspection (GVI) of the Landing Beacon

1.	Open the roof of the Hive.
2.	Turn off the charging rings and remove Bee from the Hive (if applicable).
3.	Locate the Landing Beacon through the funnel. 
4.	Inspect top housing (Beacon Dome) of the Landing Beacon for degraded plastic (Beacon Dome shows no transparency anymore (shows solid)).
5.	Inspect for cracks in the plastic.
6.	If needed, clean the landing beacon in accordance with the instructions in the next section.

3.1.13. Cleaning - Cleaning (CLN) of the Landing Beacon

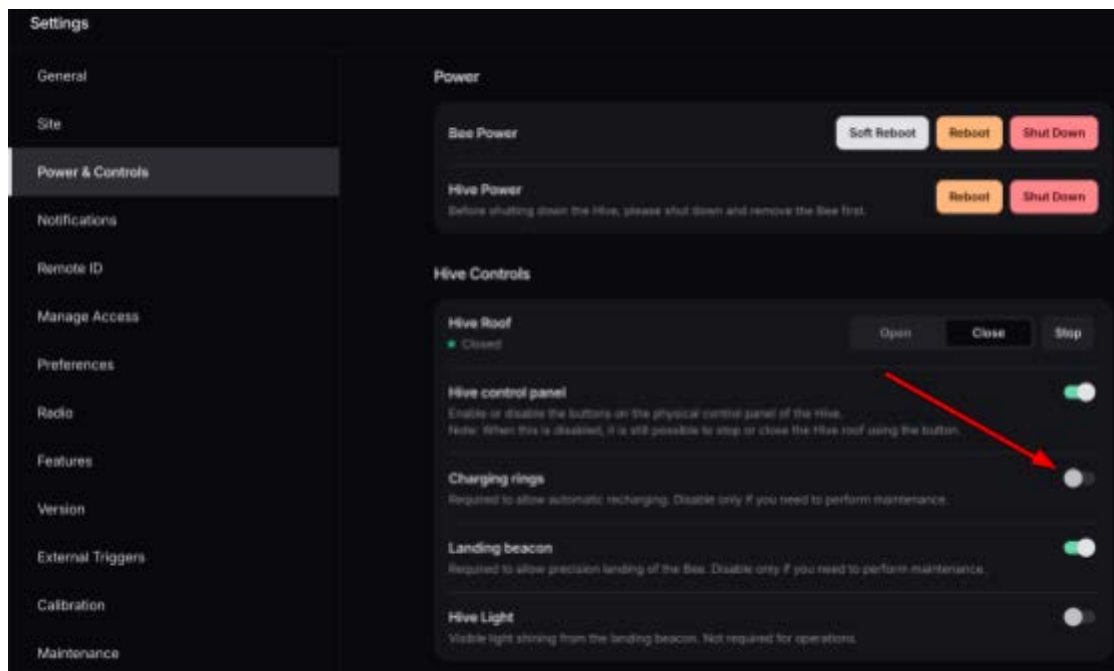
1.	Open the roof of the Hive by clicking the Open Roof button on the Maintenance page. 
2.	Turn off the charging rings and remove Bee from the Hive (if applicable).
3.	Use a wet cotton cloth (do NOT use microfiber cloths) to clean the top housing (Beacon Dome) of the Landing Beacon. Use soft non-aggressive soap for persistent debris. Caution: The edges of the Landing Funnel could be sharp. Wear protective gloves while performing this task to avoid cuts and scratches.

3.2. Bee

This section provides the detailed procedures for the Bee Maintenance Inspection Items identified in section [2.1.2](#).

Caution: Before performing any of the tasks below, turn off the charging rings on the Hive and remove the Bee from the Hive and turn it off.

- Go to **Settings** → **Power & Controls**. Toggle the **Charging rings** switch to its off position.



- Remove the Bee from the Hive
- Turn off the Bee by pressing and holding its power button

3.2.1. Instructions for Performing the General Visual Inspection of the Bee

The Bee contains safety critical parts and non-critical parts. If any damage is observed on any of the critical parts, do not fly the Bee again before the damage is fixed.

Bee Critical Parts	Bee Non-Critical Parts
• Propellers • Propeller guards • Motor mounts • Motors • Anti-collision light • Main body and motor arms • Power button • Sonar sensors • Landing camera protective glass cover	• Charging contacts • Venting holes • Payload camera unit including lens • Venting grill • Radio module heat sink • Visibility lights

During the GVI, look for signs of damage, cracks, scratches, dirt blocking cooling and venting holes, heat sink, battery electrolyte leak or signs of battery overheating (do not open the Bee for this).

The following are examples of critical findings, which require corrective action by either the Bee operator or the OEM:

- Crack(s) or any sign of damage on ANY of the propellers
- Crack(s) or any sign of damage on any of the propeller guards
- Damage to the landing camera protective glass cover.
- Damage to any of the sonar sensors' round fabric covers.
- Cracks or significant damage to the main body or motor arms
- Sign of battery electrolyte leak through venting holes or crack on the main body
- Signs of battery overheating (discoloration of plastic in the vicinity of battery mounting)

The following are examples of non-critical findings, which might impair optimum system performance but with no or negligible effect on the safe operation of the Bee:

- Damage to payload camera protective glass cover
- Damage to the charging contacts
- Short and/or shallow (minor/insignificant) scratches on the main body or motor arms
- Blocked venting holes

In case of critical finding the damaged component shall be replaced with a new one by the operator if an applicable repair procedure is provided in Section 6 of this document, or alternatively the Bee returned to the OEM for repair.

In case of non-critical finding the replacement of the damaged part is up to the discretion of the operator. The system might not deliver the specified performance with the Bee operating with those degradations.

The potential degradation of Bee performance are (but not limited to):

- Reduced range or flying time
- Deterioration of picture quality (both moving pictures and snapshots)

3.2.2. Inspection - General Visual Inspection (GVI) of Propellers and Propeller Guards

1.	Remove Bee from the Hive
2.	While holding the Bee upright, visually inspect the propellers (4x) and propeller guards (4x) of the Bee.
3.	Look for signs of damage, cracks, deep scratches, chipped pieces, fractures, leading edge erosion.
4.	In case of “out of tolerance damages” the defective part shall be replaced by the Operator or OEM before next flight.
5.	Check that the propellers are attached tightly. If not, tighten the propeller nuts.
6.	If needed, clean the propellers and propeller guards in accordance with the instructions in the next section.

3.2.3. Cleaning - Cleaning (CLN) of Propellers and Propeller Guards

1.	Hold the Bee vertically with the landing camera pointing downwards and get access to the propellers and guards.
2.	Use a slightly moist, lint free, soft cloth to gently wipe off any dirt from the propellers or propeller guards.

3.2.4. Inspection - General Visual Inspection (GVI) of Propeller Drive Motors and Motor Mounts

1.	Hold the Bee vertically by hand in its normal flying orientation with the landing camera pointing downwards and inspect the propeller drive motors (4 off).
2.	Verify that each motor is attached tightly to the motor arm by wiggling each motor.
3.	Verify that all four motor cases are undamaged.
4.	Carefully rotate the rotor of the motor by turning the propellers by hand and confirm smooth (motor cogging is normal behavior) and unblocked movement of the rotor shaft.
5.	Make sure there is no dirt, mud or foreign object filling up the cooling gaps on the motor case or protruding into the motor, potentially blocking the rotor.
6.	If needed, clean the cooling gaps of the motors in accordance with the instructions in the next section.

3.2.5. Cleaning - Cleaning (CLN) of Propeller Drive Motors

1.	Hold the Bee vertically with the landing camera pointing downwards and get access to the propeller drive motors.
2.	Clean the motor by blowing compressed air through the motor and blowing out the dirt and dust in between the motor stator and rotor, and the stator and the housing (case).
3.	Use a slightly moist, lint free, soft cloth to wipe off the remaining dirt from the motor case.

3.2.6. Inspection - General Visual Inspection (GVI) of Anti-collision Light (if applicable)

1.	Hold the Bee vertically by hand in its normal flying orientation and inspect the anti-collision light.
2.	Verify that the anti-collision light cover is present and undamaged.
3.	If needed, clean the anti-collision light in accordance with the instructions in the next section.

3.2.7. Cleaning - Cleaning (CLN) of Anti-collision Light

1.	Hold the Bee vertically with the landing camera pointing downwards and get access to the anti-collision light.
2.	Use a slightly moist, lint free, soft cloth to wipe off any dirt/dust from the anti-collision light cover.

3.2.8. Inspection - General Visual Inspection (GVI) of Bee Body and Motor Arms

1.	Hold the Bee vertically by hand in its normal flying orientation.
2.	Check the plastic body and motor arms of the Bee for signs of damage, such as cracks, deformation, and short and shallow scratches.
3.	Lightly shake the Bee and listen for the rattling of loose components. Verify that nothing is rattling inside of the Bee body.
4.	If needed, clean the Bee body in accordance with the instructions in the next section.

3.2.9. Cleaning - Cleaning (CLN) of Bee Body and Motor Arms

1.	Hold the Bee vertically by hand in its normal flying orientation.
2.	Use a slightly moist, lint free, soft cloth to wipe off any dirt/dust from the Bee body and the motor arms.

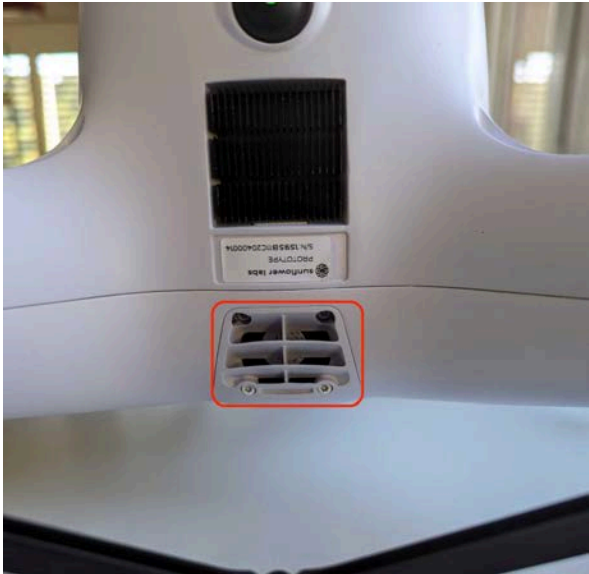
3.2.10. Inspection - General Visual Inspection (GVI) of Charging Contacts

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the charging contacts (4x, one on the bottom of each motor arm).
2.	Verify that the spring loading of the contacts are intact. You can do this by pressing the contacts downward (towards the propeller underneath) and confirming the smooth and full-travel movement of the contacts. 
3.	Verify that the gold plating on the contact surface is intact and clean. 
4.	If needed, clean the charging contacts in accordance with the instructions in the next section.

3.2.11. Cleaning - Cleaning (CLN) of Charging Contacts

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and access the charging contacts (4x, one on the bottom of each motor arm).
2.	Clean the charging contact with isopropyl alcohol and a soft, lint free cloth or alternatively use commercially available, high quality, contact cleaning agent.

3.2.12. Inspection - General Visual Inspection (GVI) of Venting Grill

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the venting grill. 
2.	Verify that the individual blades of the venting grill are straight and undamaged. Make sure there is no dirt, mud or foreign object filling up the gaps between the individual blades of the venting grill.
3.	If needed, clean the venting grill in accordance with the instructions in the next section.

3.2.13. Cleaning - Cleaning (CLN) of Venting Grill

1.	Hold the Bee upright with the landing camera pointing downward and access the venting grill.
2.	Clean the blades of the venting grill with a brush. Use a slightly moist, lint free, soft cloth to wipe off the remaining dirt from the venting grill blades.

3.2.14. Inspection - General Visual Inspection (GVI) of Radio Module Heatsink

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the radio module heatsink.
2.	Verify that the individual heatsink blades are straight and undamaged. Make sure there is no dirt, mud or foreign object filling up the gaps between the individual blades of the heatsink. 
3.	If needed, clean the heatsink in accordance with the instructions in the next section.

3.2.15. Cleaning - Cleaning (CLN) of Radio Module Heatsink

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and access the Radio Module Heatsink.
2.	Clean the blades of the Radio Module Heatsink with a brush capable of reaching the bottom plate of the heatsink.
3.	Use a slightly moist, lint free, soft cloth to wipe off the remaining dirt from the heatsink blades.

3.2.16. Inspection - General Visual Inspection (GVI) of Power Button

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the Bee power button
2.	Look for signs of damage and cracks.
3.	Check that the power button is affixed tightly.
4.	In case of dirt or grease on the power button, clean the item in accordance with the instructions in the next section.

3.2.17. Cleaning - Cleaning (CLN) of Power Button

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards with the Bee power button facing towards you
2.	Clean the power button with a moist cloth. Use soft non-aggressive soap for persistent debris and rinse with clean water after.

3.2.18. Inspection - Detailed Visual Inspection (DVI) of Payload Camera Lens

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the payload camera by illuminating the protective glass cover with a light source under an incident angle of approximately 45 deg.
2.	Look for signs of damage, cracks, scratches.
3.	The following are the findings which require corrective action by either the Bee operator or the OEM. • Crack(s) or scratches on the glass surface • Dirt or grease on the glass surface Note: Unless the recorded image quality is degraded to an unsatisfactory level, there is no need to send the Bee for repair back to the OEM.
4.	If dirt or grease on the protective glass cover surface is found, clean the item in accordance with the instructions in the next section.

3.2.19. Cleaning - Cleaning (CLN) of Payload Camera Lens

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the landing camera by illuminating the protective glass cover with a light source under an incident angle of approximately 45 deg.
2.	Clean the protective glass cover surface with a moist cloth and isopropyl alcohol. Wipe off the residual liquid from the surface with a lint free textile cloth.

3.2.20. Inspection - General Visual Inspection (GVI) of Sonar Sensors

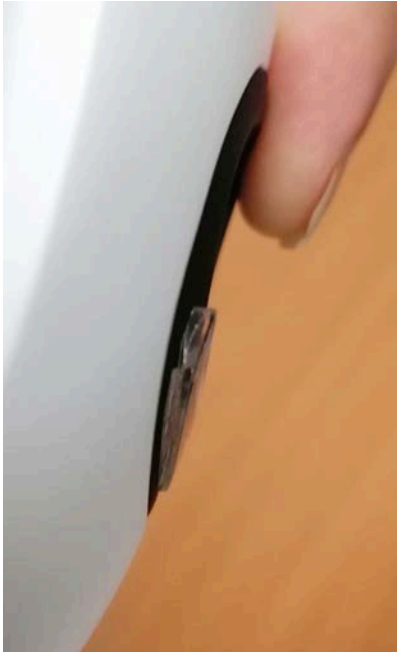
1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the sonar sensors. There are 4 sonar sensors on the side wall of the bottom cowl of the vehicle, 90 deg equally spaced apart. 
2.	Verify that the protective fabric covering the sonar sensors are free of dirt and undamaged.
3.	If needed, clean the protective fabric over the sonar sensors in accordance with the instructions in the next section.

3.2.21. Cleaning - Cleaning (CLN) of Sonar Sensors

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and access the sonar sensors. There are 4 sonar sensors on the side wall of the bottom cowl of the vehicle, 90 deg equally spaced apart.
2.	Clean the protective fabric over sonar sensors, with a dry brush by brushing off the dirt from the protective hard foam.
3.	Use a lightly moist, lint free, soft cloth to wipe off the remaining dirt from the foam. Only apply very gentle force. Caution: Do not use excessive amounts of liquid and soak in liquid the protective foam. Liquid penetrating into the sensing element of the sonar sensor might damage the sensor and render the component inoperative.

3.2.22. Inspection - General Visual Inspection (GVI) of Visibility Lights

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the visibility lights.
2.	Verify that the visibility light covers are present and undamaged. HW version 0.11 and earlier:  HW version 0.12 and later: 

3.	Verify that the visibility light covers are positioned correctly and flush with the body. HW version 0.11 and earlier:  HW version 0.12 and later: 
4.	If needed, clean the visibility lights in accordance with the instructions in the next section.

3.2.23. Cleaning - Cleaning (CLN) of Visibility Lights

1.	Hold the Bee vertically with the landing camera pointing downwards and get access to the visibility lights.
2.	Use a slightly moist, lint free, soft cloth to wipe off the remaining dirt/dust from the visibility lights.

3.2.24. Inspection - Detailed Visual Inspection (DVI) of Landing Camera Lens

1.	Place the Bee on a horizontal surface upside down with the landing camera pointing upwards and inspect the landing camera by illuminating the protective glass cover with a light source under an incident angle of approximately 45 deg.
2.	Look for signs of damage, cracks, scratches on protective glass cover.
3.	The following are the critical findings which require corrective action by either the Bee operator or the OEM. • Crack(s) or scratches on the glass surface Note: Unless the Bee landing performance is degraded there is no need to send the Bee for repair back to the OEM due to scratches.
4.	The following are the non-critical findings which might impair optimum system performance but with no or negligible effect on the safe operation of the Bee. • Dirt or grease on the glass surface
5.	In case there is dirt or grease on the protective glass cover, clean the item in accordance with the instructions in the next section.

3.2.25. Cleaning - Cleaning (CLN) of Landing Camera Lens

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and illuminate the protective glass cover with a light source under an incident angle of approximately 45 deg.
2.	Clean the protective glass cover surface with a moist cloth with isopropyl alcohol. Wipe off the residual liquid from the surface with a lint free textile cloth

3.2.26. Inspection - General Visual Inspection (GVI) of Venting Holes

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and inspect the venting holes while illuminating the holes from above with a light source. Depending on the version of the Bee there could be one drain hole around the landing camera(left) or 52 drain holes on the vehicle (right). Ten on each propeller arm (4x10=40) and 12 around the protective glass cover of the landing camera.
2.	Look for drain holes blocked by dirt or mud or foreign objects.
3.	If needed, clean the blocked venting holes in accordance with the instructions in the next section.

3.2.27. Cleaning - Cleaning (CLN) of Venting Holes

1.	Place the Bee on a horizontal surface with the landing camera pointing upwards and illuminate the venting holes from above.
2.	Remove dirt or foreign objects blocking the venting holes by inserting a needle with a diameter of approximately 1-1.5 mm into the holes and pushing it inside the vehicle by about 3 mm.
3.	Any dirt remaining on the inner wall of the holes can be blown off (or sucked out) by using compressed air (or a vacuum source).
4.	The drain holes which are located around the Landing Camera can only be cleaned using a vacuum source.
5.	Once the drain holes are cleaned, wipe off the motor arms and the bottom cone of the vehicle with a slightly moist, soft, lint free cloth.

3.2.28. Inspection - Detailed Visual Inspection (GVI) of Screws

1.	Place the Bee on a horizontal surface upside down with the landing camera pointing upwards and inspect all the screws holding together the plastic structure of the Bee.
2.	Verify that all 3 screws in each of the 4 motor arms are present.  A close-up photograph of a white motor arm of a drone. Three red arrows point to the screw holes on the arm: one at the base where it connects to the motor, one in the middle, and one at the end. The arm is positioned against a blue background.
3.	Wiggle each motor arm and verify that the top and bottom fuselage parts are connected tightly.
4.	Verify that the 4 screws in the cowl are present.  A close-up photograph of the front of the drone's white cowl. A red arrow points to a screw hole located between the two camera lenses. The drone is positioned against a blue background.
5.	Wiggle the cowl and verify that the cowl is connected tightly to the fuselage.
6.	Verify that the screws in the camera payload are present.



7. Wiggle the camera payload and verify that it is attached tightly to the fuselage.

Caution: After performing the tasks above, make sure that the charging rings on the Hive are turned on again.

4. Operational Checks (OPC)

Caution: To run the following tests, the Bee must be powered on.

4.1. Operational Check of the Ventilation Fan

1.	Hold the Bee upright in your hand.
2.	Verify that the Bee is powered on by checking that the green light illuminates in the switch. If the green light is not on, press the power button on the side of the Bee.
3.	Verify that the ventilation fan operates and generates the airflow required for ventilation: • The fan operation can be confirmed by simply listening to the noise generated by the fan. • The proper generation of airflow can be confirmed by holding the hand at the ventilation grill.

4.2. Operational Check of the Visibility Lights

1.	Hold the Bee upright in your hand.
2.	Verify that the Bee is powered on by checking that the green light illuminates in the switch. If the green light is not on, press the power button on the side of the Bee.
3.	From the Maintenance page, click the Test Visibility Lights button. Test Visibility Lights
4.	Verify that all 4 visibility lights are blinking green at a roughly 1 second interval for about 20 seconds.

4.3. Operational Check of the Anti-Collision Light

1.	Verify that the Bee is powered on by checking that the green light illuminates in the switch. If the green light is not on, press the power button on the side of the Bee.
2.	Place the Bee back in the Hive, leave the Hive roof open, and step away from the Bee by at least 5 meters.
3.	From the Maintenance page, click the Turn On Anti-Collision Light button. Turn On Anti-Collision Light
4.	Verify that the anti-collision light blinks at regular intervals.
5.	Click the Turn Off Anti-Collision Light button. Turn Off Anti-Collision Light
6.	Verify that the anti-collision light is off.
7.	Close the Hive roof. Close Roof

4.4. Operational Check of the Remote ID System

1.	Verify that the Bee is powered on by checking that the green light illuminates in the switch. If the green light is not on, press the power button on the side of the Bee.
2.	Place the Bee in the Hive (if not already done).
3.	Verify that the CS is not indicating a Remote ID error.
4.	Open the Remote ID tracker app (see 2.9.1. Remote ID Tracker App).
5.	Verify that the Remote ID tracker app is receiving remote ID messages from the • UAS ID (for Japanese customers, check that both UAS ID are displayed) • UAS ID type • UA type • Operational status • Auth data (Japan customers only) • Operator ID (European customers only) • UA Latitude • UA longitude

4.5. Operational Checkout Flight

Note: During the operational checkout flight, the Bee will climb to approximately 4 meters above the Hive, rotate in the horizontal once around its own axis, and then descend and land back in the Hive.

1.	Verify that the CS is not indicating any system errors.
2.	Make sure that the Bee is sufficiently charged for completing a short (approx. 1 min) flight.
3.	Ensure that the safety exclusion zone is clear of people and obstructions.
4.	From the Maintenance page, click the Perform Test Flight button. Perform Test Flight
5.	Monitor the Bee and verify that the vehicle is stable in flight.
6.	Verify the Bee is holding a stable altitude while rotating 360 degrees.
7.	Verify that the flight is being shown and that the video is being streamed smoothly in the CS.
8.	Verify that no system failure indication is present on the CS
9.	While landing, verify that the Bee is centering above the Hive and not exhibiting any shaking during the descent.
10.	Verify the Bee landed and that the roof closed automatically.
11.	After landing, verify that the Bee starts recharging its battery.
12.	Wait a few seconds and verify that the system is ready to fly without any system failure indications present.
13.	Go to the Events page and verify that the flight was logged and that the video from the flight can be replayed.

5. Removal/Installation of Components

5.1. Propellers

Note: The propeller(s) replacement must be recorded in the [maintenance logs](#).

The directions of rotation are given when looking at the Bee from the top.



Figure 1 - Directions of propellers' rotations

The following identifications (color codings) are applied:

Table 1 - Propeller, rotor shaft and fixation nut color coding

Propeller rotation	Propeller	Rotor shaft	Nut
Clockwise (CW)	Black ring	Black	Black
Counter-clockwise (CCW)	Silver ring	Silver	Silver

In order to prevent loosening of the propeller nuts during normal operation, for the fixation of the counter-clockwise (CCW) rotating propellers “normal nuts” are used while for the clockwise (CW) rotating propellers “reverse nuts” are used.

Table 2 - “Normal” and “Reverse” nuts color coding and rotation

Nut	Nut Color	Used with	Tightens	Loosens
“Normal”	Silver	CCW rotating propeller (with silver ring)	by turning CW	by turning CCW
“Reverse”	Black	CW rotating propeller (with black ring)	by turning CCW	by turning CW

Caution: When loosening and tightening the propeller nuts, make sure you are turning the nut the proper direction as described in Table 2 above or you may damage the motor.

5.1.1. Propeller Removal

1. If the Bee is located in the Hive, turn off the charging rings from the GCS, open the Hive roof and remove the Bee carefully from the Hive by lifting the Bee by its motor arms.

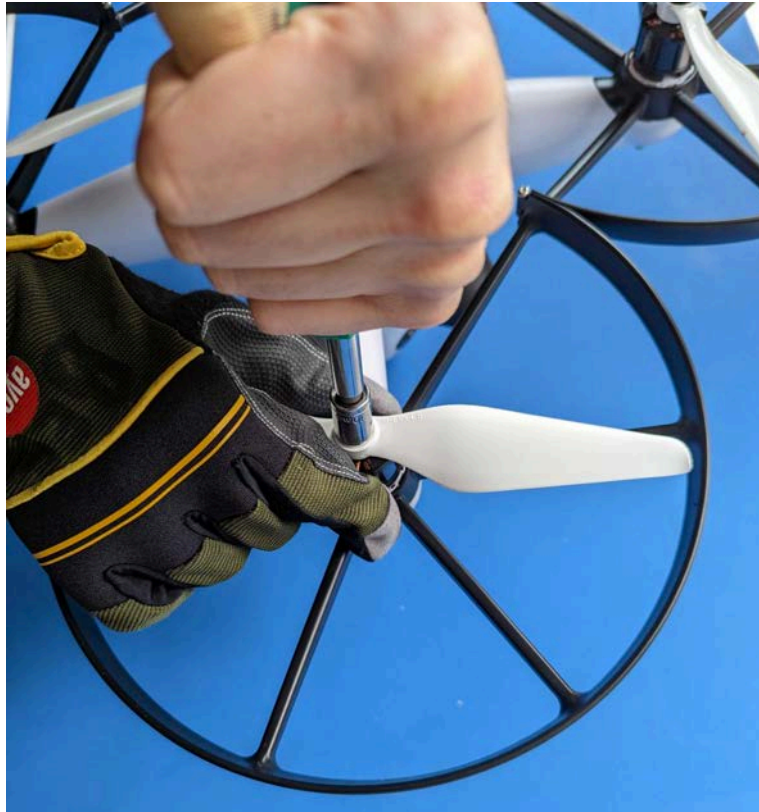


2. Identify the propeller to be removed. There are two different types of propellers installed, two clockwise (CW) rotating propellers and two counter-clockwise (CCW) rotating ones. Four propellers in total. See [5.1. Propellers](#) for details.

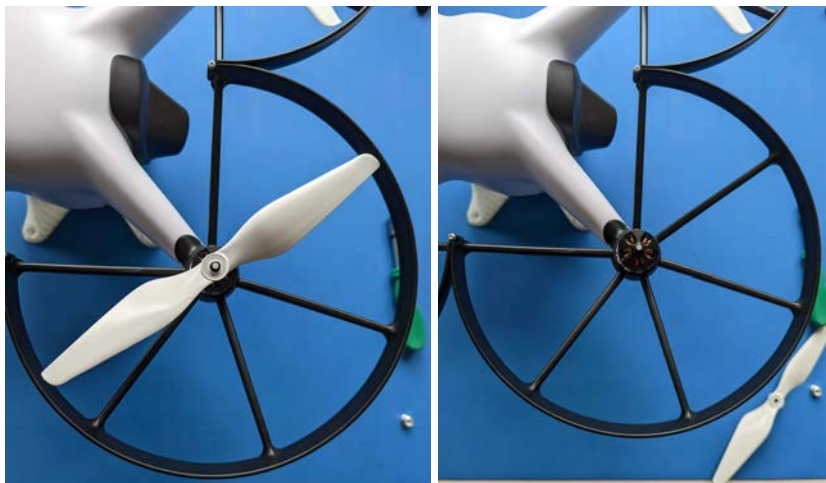


3. Place the Bee on a horizontal surface with the propellers at the top (normal flying orientation).
4. With one hand hold the propeller and the rotor of the electric motor together and with the other hand place a M10 socket head driver on the nut.

Caution: Wear a protective glove on the hand used for holding the propeller and the rotor of the electric motor together in order to avoid injury to the fingers. The sharp edges of the propeller might cut into your fingers while holding the rotor still and applying torque to the nut.



5. Depending on the type of the nut (“Normal” - silver color or “Reverse” - black color) loosen the nut by turning it to the direction as given in Table 2.
6. Remove the nut from the rotor shaft and pull the propeller off the shaft.



5.1.2. Propeller Installation

1. Identify the direction of the motor rotation where the propeller to be installed. See [5.1. Propellers](#) for further details.

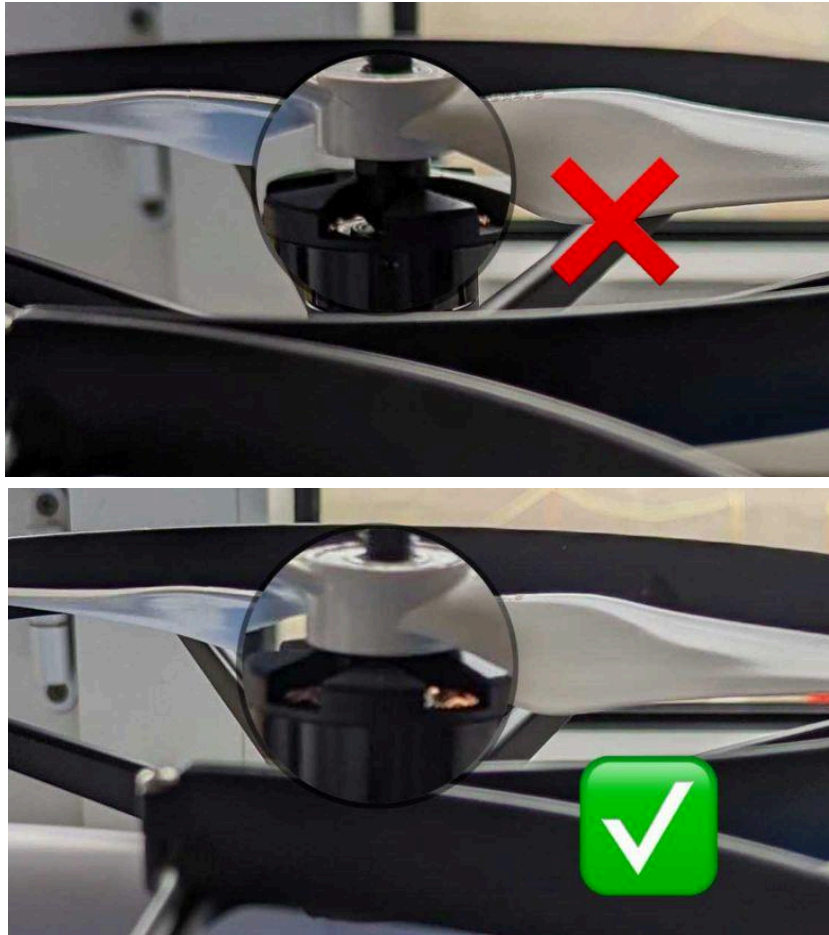
Hint: If the motor's rotor shaft is painted to a silver color then it rotates counter-clockwise (CCW), if it is painted black then it rotates clockwise (CW).

2. Select the correct propeller for installation. For CW rotating motors (with black colored shaft) use CW rotating propellers (identified with black dot). For CCW rotating motors (with silver colored shaft) use CCW rotating propellers (identified with silver dot).



3. Place the propeller onto the motor shaft, making sure it has gone all the way down and with one hand hold the propeller and the motor's rotor together, while with the other hand place the propeller nut onto the rotor shaft and tighten it with a M10 socket head torque driver. Tighten the nut with 2.5 Nm.

Caution: Wear a protective glove on the hand used for holding the propeller and the rotor of the electric motor together in order to avoid injury to the fingers. The sharp edges of the propeller might cut into your fingers while holding the rotor still and applying torque to the nut.



4. Check that the propellers are firmly attached to the motors and that they spin freely. Manually spin the propellers to make sure they spin freely, together with the motor, and do not touch any other parts of the Bee such as the Bee body or propeller guards. You should not be able to spin the propellers while holding the motors fixed.
5. Perform the Operational test of the system in accordance with section [4.5](#).

5.2. Camera Payload Replacement

Note: The camera payload replacement must be recorded in the [maintenance logs](#).

Caution: Ensure that the Bee is powered off before proceeding.

5.2.1. Removing the Camera Payload (HW version 0.11 and earlier)

To remove the camera payload, follow these steps:

1. Place the Bee upside down on a flat surface so that it will rest on the motor shafts. Remove the screw on the bottom of the camera payload. Use a torx key of size TX8 . Carefully set the screw aside. You will use it later to reattach the camera payload.



2. Detach the camera payload from the Bee by pulling the hatch on the top next to the screw. Then pull from the bottom to release the rest of the hatch.

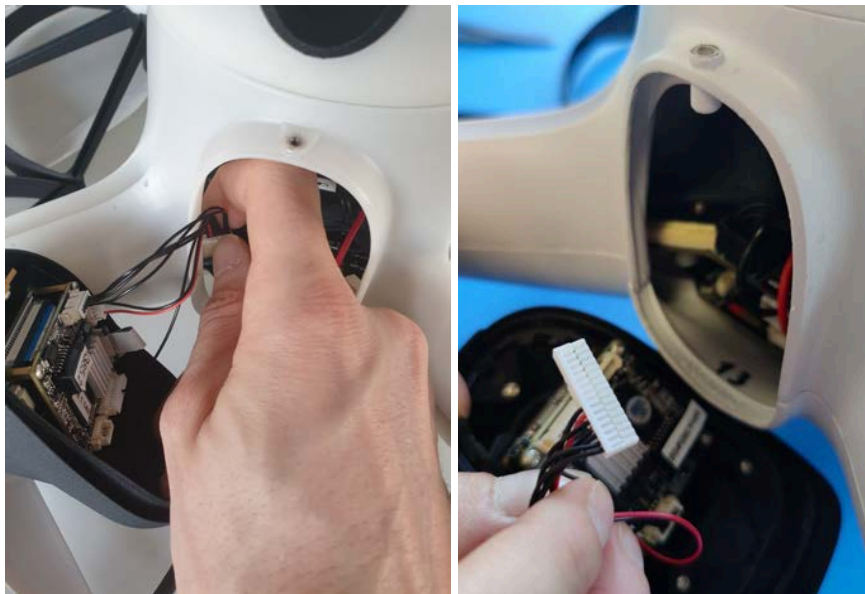


Note: The camera payload is snap-fitted, in order to remove it safely, gently wiggle the part while pulling it towards you.

Once the panel is free, set it down in front of the camera without disconnecting any cables and without exerting undue stress on the connections.



3. Disconnect the camera payload connector where it is connected inside the Bee. The connector has a clip. With two fingers first push the clip and then pull the connector.



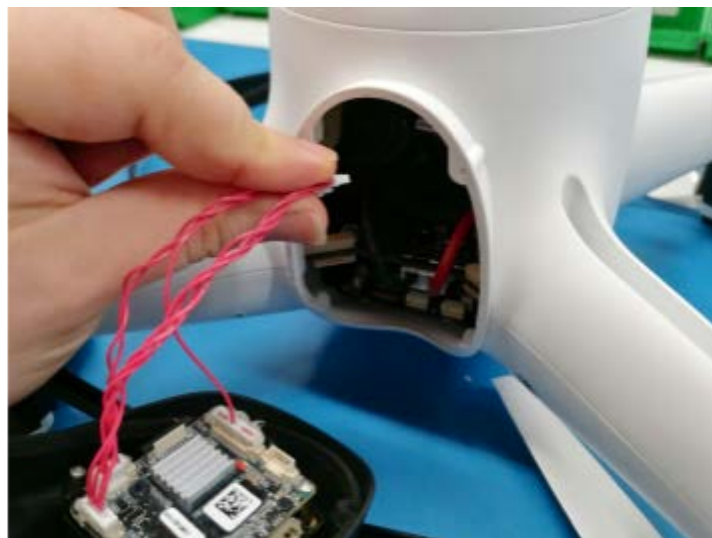
5.2.2. Removing the Standard Camera Payload (HW version 0.12 and later)

To remove the standard camera payload, follow these steps:

4. Place the Bee upside down on a flat surface so that it will rest on the motor shafts. Remove the 4 screws on the camera payload. Use a torx key of size TX8. Carefully set the screw aside. You will use it later to reattach the camera payload.



5. Detach the camera payload from the Bee.
6. Disconnect the camera payload connector where it is connected inside the Bee. The connector has a clip. With two fingers first push the clip and then pull the connector.



5.2.3. Removing the Thermal Camera Payload (HW version 0.12 and later)

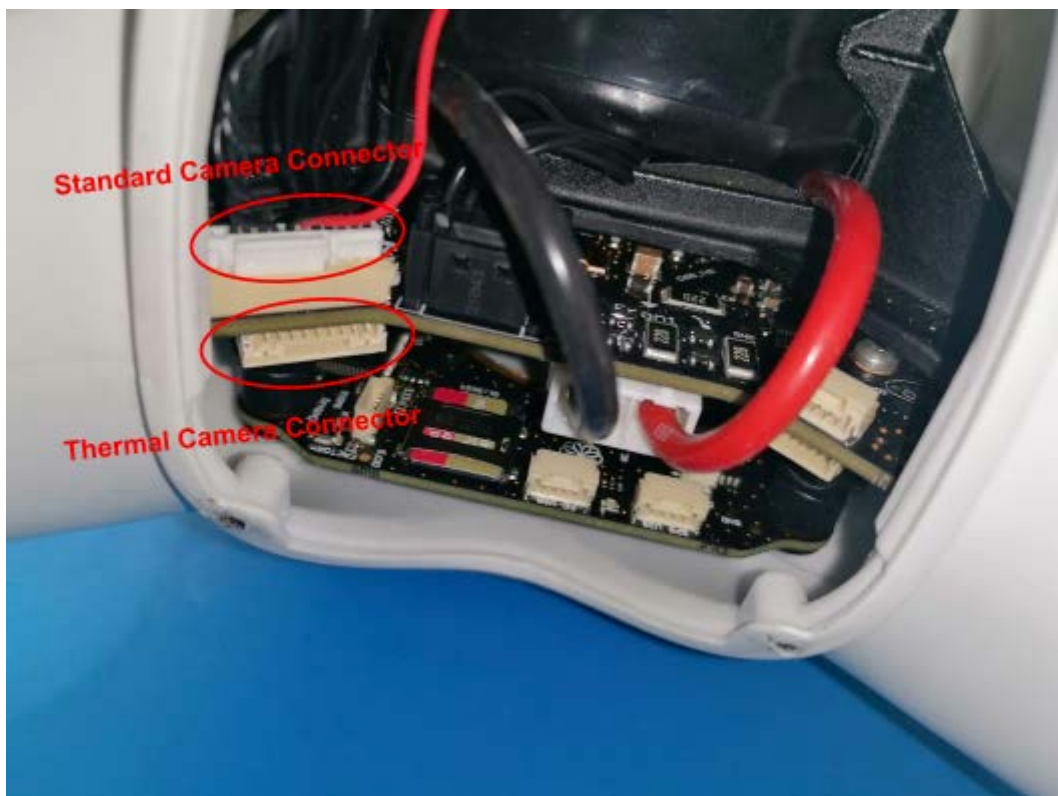
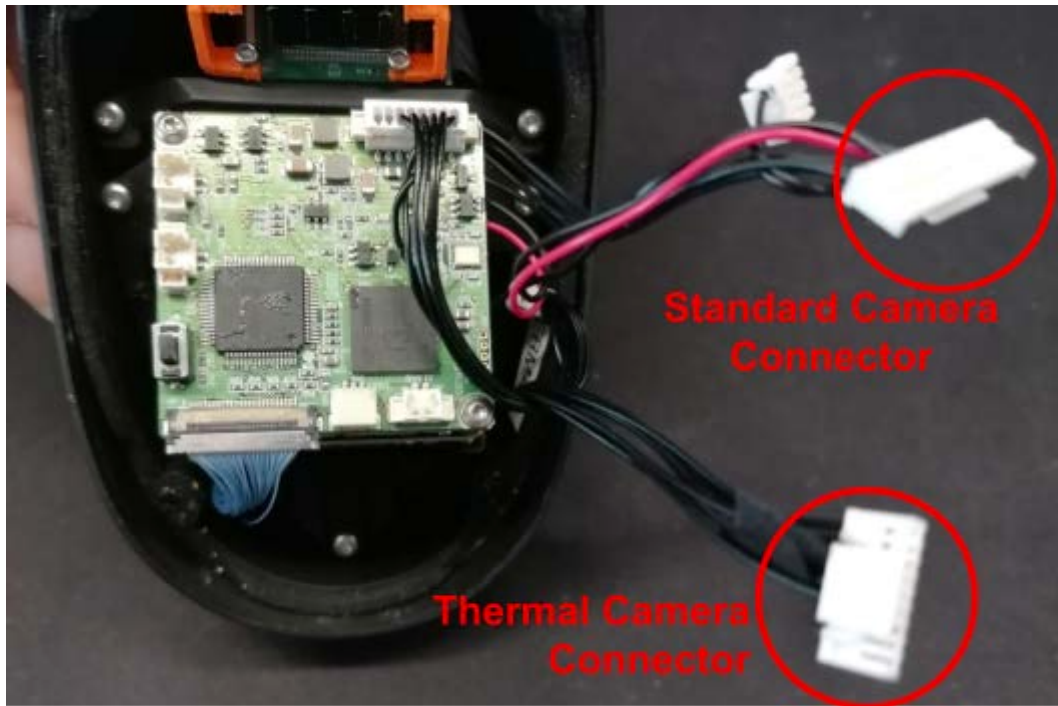
To remove the thermal camera payload, follow these steps:

1. Place the Bee upside down on a flat surface so that it will rest on the motor shafts. Remove the 4 screws on Thermal Payload. Use a torx key of size TX8 . Carefully set the screw aside. You will use it later to reattach the camera payload.



2. Detach the camera payload from the Bee.

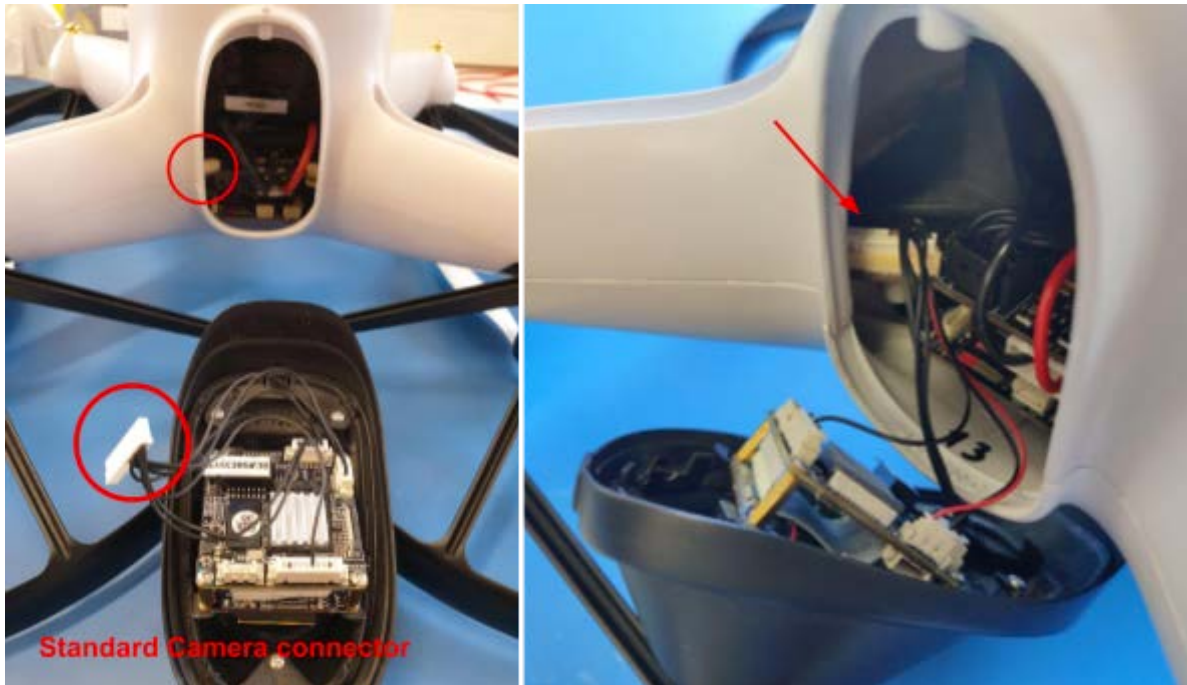
3. Disconnect the standard camera and the thermal camera connector where it is connected inside the Bee. The connector has a clip. With two fingers first push the clip and then pull the connector.



5.2.4. Attaching the Camera Payload (HW version 0.11 and earlier)

To (re)attach the camera payload to the Bee, follow these steps:

1. Place the camera payload close to the drone like in the picture and connect the camera payload connector to the drone power board.



2. Attach the camera payload to the Bee. First place the camera payload into the appropriate slot on the Bee, as shown in the previous image.



3. Then push the payload towards the drone frame until the holes for the screw are aligned on one side and on the other side you hear a click. If you feel resistance while pushing the panel on, make sure no camera cable is squeezed between the Bee's body and camera payload.



Note: The gap between the black plastic part of the camera payload and the white frame has to be small like in the following picture.



4. Once the camera is correctly mounted on the Bee body, secure it using the self taper screw (Thread-Forming 2.63x12 screw) to 0.5 Nm as shown below:



5.2.5. Attaching the Standard Camera Payload (HW version 0.12 and later)

To (re)attach the standard camera payload to the Bee, follow these steps:

5. Place the camera payload close to the Bee like in the picture and connect the camera payload connector to the Bee's power board.



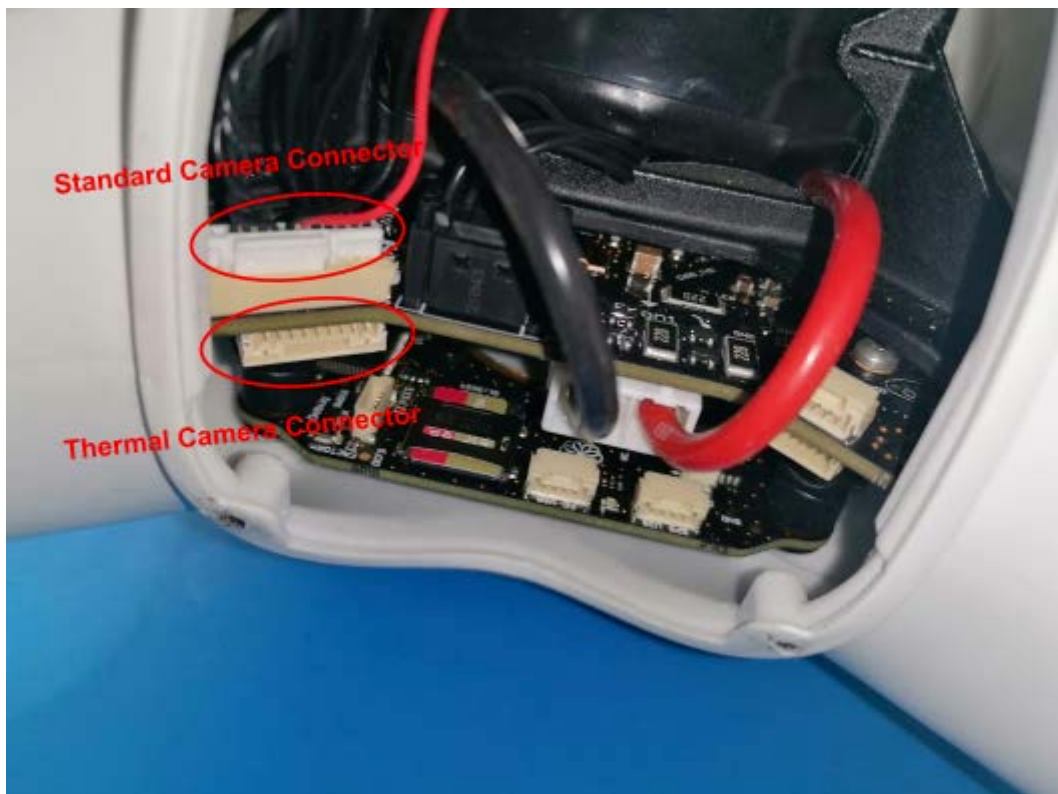
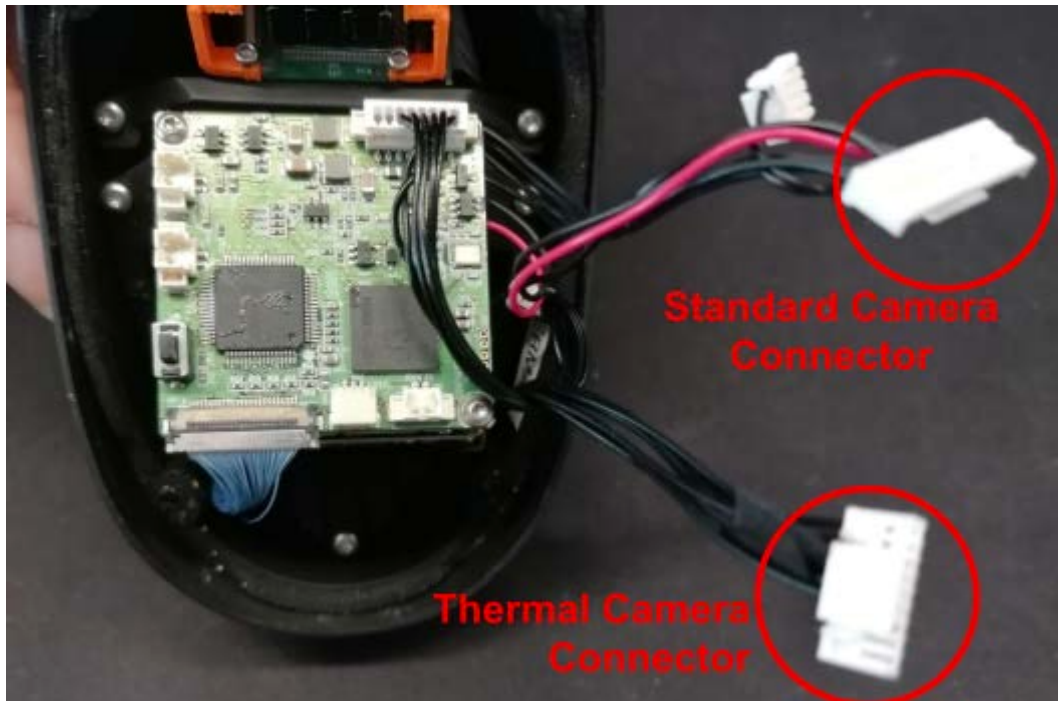
6. Position the payload on the Bee's body and make sure the payload gasket is nicely attached
7. Secure the payload using 4 M2.63 x 10 torx crews (screws were put aside during removal)



5.2.6. Attaching the Thermal Camera Payload (HW version 0.12 and later)

To (re)attach the thermal camera payload to the Bee, follow these steps:

1. Place the camera payload close to the Bee like in the picture and connect the standard camera payload connector and the thermal camera connector to the Bee's power board.



2. Position the payload on the Bee's body and make sure the payload gasket is nicely attached
3. Secure the payload using 4 M2.63 x 10 torx crews (screws were put aside during removal)



5.3. Battery Replacement

Note: The battery replacement must be recorded in the [maintenance logs](#)

Caution: Ensure that the Bee is powered off before proceeding.

5.3.1. Battery Removal

5.3.1.1. Payload Removal

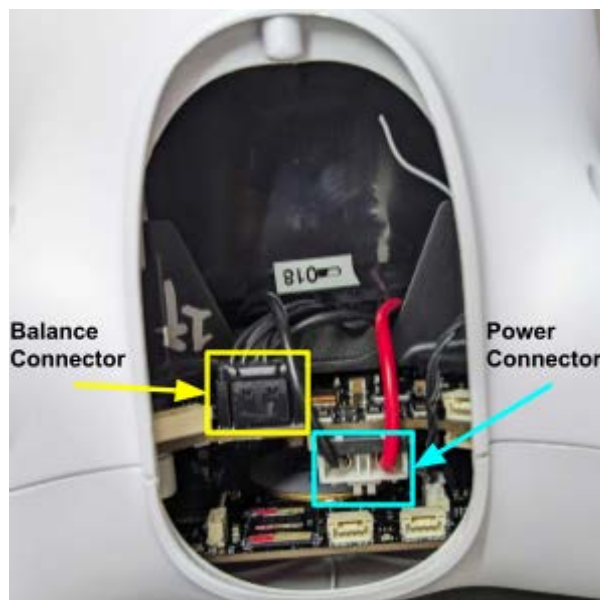
In order to replace the battery, the camera payload must first be removed according to the instructions in section [5.2](#).

5.3.1.2. Disconnecting the Battery

Before the battery can be disconnected, the camera payload must first be removed according to the previous section.

After detaching the camera payload:

Carefully disconnect the battery power connector (white) and then the balancer connector (black). The latter might require pliers or a screwdriver to make this easier. When using metal pliers or connectors, proceed with caution in order not to short out the battery or other electronics.



5.3.1.3. Removing the Battery

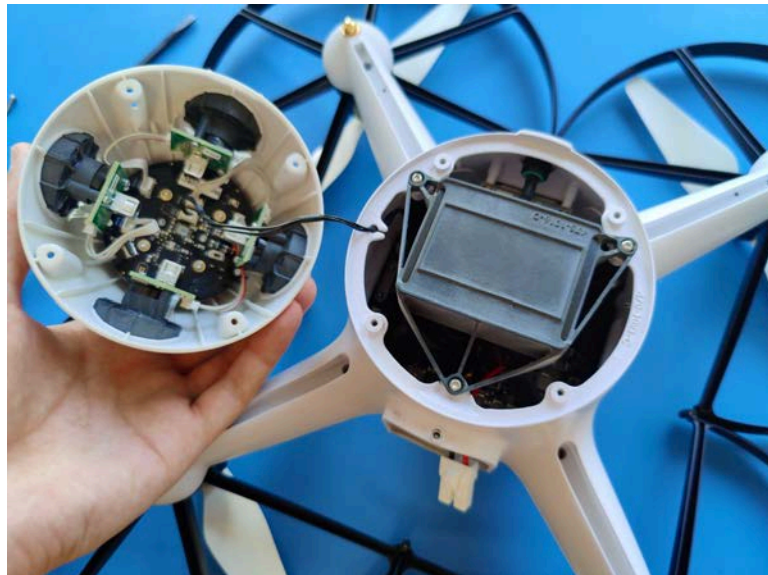
In order to remove the battery from the Bee fuselage, the battery must first be disconnected according to the previous section.

To remove the battery, disconnect the battery first and then follow these steps:

1. Turn Bee upside down
2. Remove all 4 cowl screws.



3. Remove the cowl



4. Unscrew the 3 fasteners holding the battery cage in position

Note: It could happen that one or more fasteners will drop within the fuselage during the removal process. If this happens, gently shake the Bee until all fasteners are out.



5. Remove the battery cage and pull battery (and cables) out of Bee fuselage



6. Dispose of the battery in accordance with section [5.3.3](#).

5.3.2. Battery Installation

5.3.2.1. Inserting the Battery

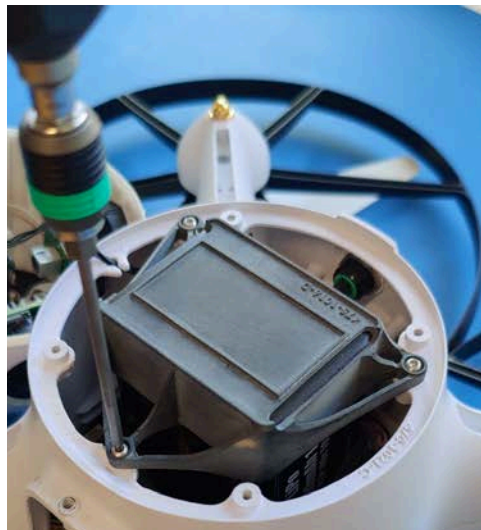
In the following steps it is assumed that the previous battery has already been removed and the cowl is already removed and disconnected. If this is not the case, follow the instructions in section [5.3.1](#).

To insert the battery into the Bee fuselage follow these steps:

1. Carefully slide the battery into the fuselage. The connectors have to face the camera payload hole.



2. Place the cage on top of the battery and screw the battery holder to the fuselage to 0.5 Nm of torque.



3. Connect the cowl paying attention to the alignment. The arrow on the cowl has to point the arrow on the drone as shown in the following pictures.



4. Secure cowl to fuselage, apply 0.5 Nm of torque.



Follow the steps in section [5.3.2.2](#) to connect the battery.

5.3.2.2. Connecting the Battery

To (re)connect the battery, follow these steps:

1. Remove any protective tape from the battery connectors.
2. Connect the balancer connector (black) to the black port and then the battery power connector (white) to the white port.



5.3.2.3. Payload Installation

After replacing the battery and before powering on the Bee, the camera payload must be reattached according to section [5.2](#).

5.3.3. Battery Disposal

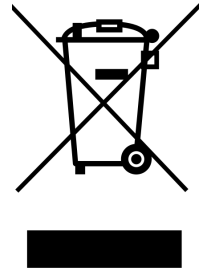
5.3.3.1. CE Compliance Information for the EU market

Dispose of faulty and/or damaged batteries in specific recycling containers.

DO NOT dispose of the battery in regular trash.

STRICTLY follow the local regulation regarding the disposal and recycling of LiPo batteries.

In case of doubt, contact a professional battery disposal/recycling company for future assistance.



6. Airworthiness Limitations

None

7. Maintenance Record Keeping

The maintenance records consist of all completed maintenance checklists and a record of all hardware modifications to the UAS system. The operator of the system must keep record of all maintenance activities on any of the system components.

8. Maintenance Log

Hive S/N:	
Hive HW Version:	

Bee S/N:	
Bee HW Version:	

The undersigned certifies that the system maintenance checklist was fully completed by a competent and/or qualified entity and that all extraordinary maintenance performed or hardware changes applied were noted in the maintenance record below.

Date	Notes	Initials

9. Occurrence Reporting to Manufacturer

The following must be reported to the manufacturer:

- Hard landing outside of the Landing Safety Exclusion Zone (LSEZ) of the Hive
- Total loss of control over the Bee including vehicle runaway

9.1. Manufacturer Occurrence Reporting Form

To report an occurrence to the manufacturer, please use the following online form:

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

10. Acronyms/Terms

Acronym	Description
Bee	The Unmanned Aircraft (UA)
C3	Command, Control and Communication datalink
CLN	Cleaning
CS	Control Station (the application running on a desktop, laptop, mobile device)
DVI	Detailed Visual Inspection
GS	Ground Station (The Hive)
GVI	General Visual Inspection
Hive	The Ground Station (GS)
OPC	Operational Check
UA	Unmanned Aircraft (The Bee)
UAS	Unmanned Aircraft System
3MO	Three Month
12MO	Twelve Month

11. Definitions

Expression	Definition
Cleaning	Removal of dirt in order to return an item to a specific standard
Critical parts	Failure whose might lead to loss of flight control, or inadequate landing guidance
Detailed Visual Inspection	An intensive visual examination of a specified detail, assembly or installation. Likely to require the use of tools such as light source and/or magnifier.
General Visual Inspection	A visual examination that will detect obvious unsatisfactory conditions/discrepancies.
Hard landing	Landing on hard surface with unusually high vertical rate or landing outside of the landing box

Expression	Definition
High vibration	A vibration that can be visually detected while the Bee is at eye level and observed from the boundary of the landing zone. Automatically detected and alert provided by the system.
Non-critical components	Components whose failure might lead to certain performance degradations but have no effect on the safe operation of the air vehicle.
Operational Check	A failure finding task to determine if an item is fulfilling its intended
Out of Tolerance Damage	A structural damage that renders the Bee unsafe to fly.
Slush/dirt ingestion	Landing in slushy snow or mud,
Water landing	Landing in water where the Bee might fully or partially sink below the water level

12. Record of Revisions

Rev	Date	Change Description
A	3 Mar 2025	Initial release.
B	9 Jul 2025	- Changed visibility lights test to instruct to just click the Test Visibility Lights button. - Added sections for removal and installation of HW version 0.12 and later payloads. - Added caution about turning the propeller nuts according to the directions in the table.