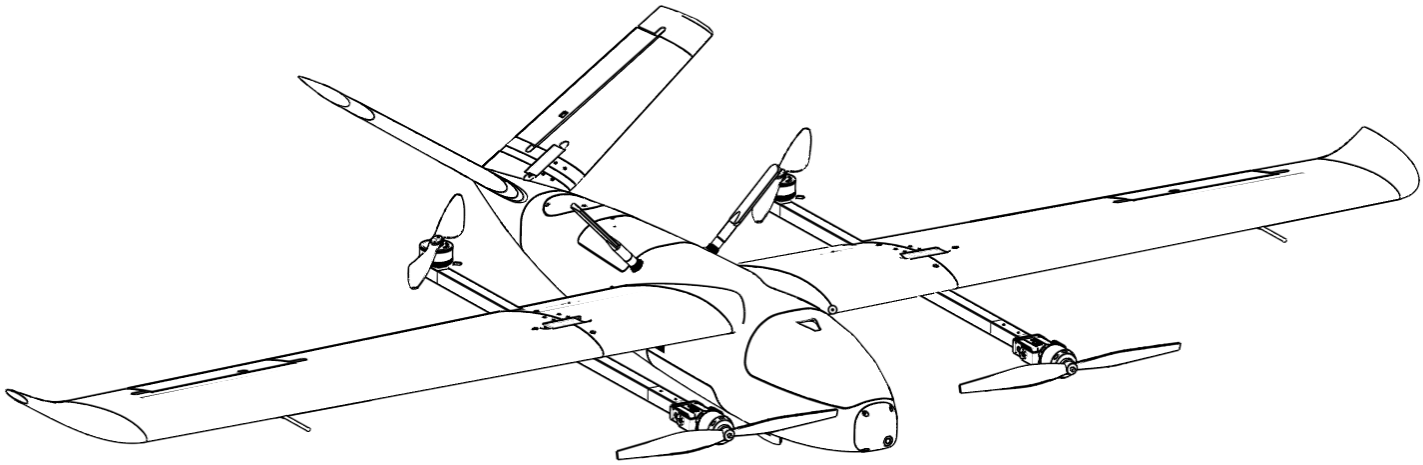
VeraSys

BROLGA

VTOL UAS



USER MANUAL

V1.2

Table of Contents

Document Version

Version	Date	Description of Change
V1	08/07/2026	• Initial release
V1.1	14/07/2026	• Updated arming/disarming procedures to remove inaccurate wording • Additional warnings for manually disarming • Additional warning for usage of 'LOITER' flight mode
V1.2	04/08/2026	• Added section '10.5.4 – Automatic Crewed Aircraft Avoidance' to explain expected avoidance behaviour

Glossary of Terms

Term	Definition
AGL	Above ground level. Altitude measured relative to the terrain directly below the UAS.
AMSL	Above mean sea level. Altitude relative to sea level.
ArduPilot	Open-source autopilot software that provides flight control, navigation, and mission automation for UASs.
Automated Flight	UAS operation without manual operator control, guided by pre-programmed mission commands.
CASA	Civil Aviation Safety Authority. The Australian government body regulating aviation safety.
Cube Orange	The flight controller hardware used in the Brolga UAS, running ArduPilot firmware.
Failsafe	Pre-programmed safety actions triggered when abnormal conditions occur (e.g., low battery, loss of signal).
GCS	Ground control station. Herelink controller running QGC software used to plan missions, monitor telemetry.
Geofence	A virtual boundary set in QGC that restricts UAS operation to a defined area.
Herelink	Integrated remote control, telemetry, and video transmission system used with the Brolga UAS.
Li-Ion	Lithium-ion. Rechargeable battery type used to power the UAS.
MTOW	Maximum takeoff weight. The maximum weight at which the UAS is permitted to take off, including payload and batteries.
Payload	Equipment carried by the UAS (e.g., camera) that is not essential for flight.
QGC	QGroundControl. Mission planning and flight control software used with ArduPilot.
RTL	Return to launch (home point).
Transition	The process of switching between VTOL flight mode and fixed-wing flight mode.
UAS	Uncrewed Aerial System.
VTOL	Vertical takeoff and landing.

1 CRITICAL SAFETY INFORMATION – READ BEFORE USE

This UAS system is a high-energy powered aircraft. Incorrect operation may result in serious injury, death, or significant property damage.

1.1 Intended Use

The Brolga VTOL UAS is designed for:

- Agricultural survey and mapping
- Remote sensing operations
- Operation in controlled, low-density airspace environments under CASA regulations

1.2 Prohibited Use

The UAS must NOT be used for:

- Operations over or near people
- Urban or built-up area operations without specific CASA approval
- Carriage of hazardous, explosive, or unauthorised payloads
- Operation outside specified environmental limits
- Any use not explicitly described in this manual

1.3 Operator Responsibility

The operator:

- MUST comply with all applicable CASA regulations and approvals
- MUST ensure safe separation from people, property, and other aircraft
- MUST confirm the UAS is airworthy prior to flight
- MUST follow all procedures in this manual

Failure to comply may result in:

- Serious injury or fatality
- Regulatory breach
- Loss of warranty coverage

1.4 Hazard Severity Definitions

⚠ WARNING
Risk of serious injury, death, or major damage

⚠ CAUTION
Risk of equipment damage or degraded performance

NOTE
Important operational guidance

2 Introduction

2.1 Purpose of Manual

This manual provides comprehensive guidance for the safe, effective, and reliable operation of the Brolga VTOL UAS system. It is intended for operators, technicians, and mission planners who are responsible for preparing, deploying, and maintaining the UAS and associated ground control systems.

The manual covers system overview, setup procedures, mission planning, operation protocols, maintenance, and safety information. It is designed to ensure that users can:

- Understand the system components and their functions
- Safely configure and operate the UAS across its full mission envelope
- Troubleshoot common issues and perform regular maintenance
- Optimise mission planning and payload use for different operational scenarios

Operators are expected to have a basic understanding of uncrewed aerial vehicles (UASs), RC systems, and the QGC software.

This manual defines the general operation of the UAS. Customer-specific procedures may be provided separately and take precedence where applicable.

2.2 System Overview

Key features include:

- **VTOL capability** – The 2+2 tilt rotor configuration allows the Brolga platform to take off and land vertically, making it ideal for operating in constrained environments
- **Long endurance** – The Brolga platform can operate up to 2.5 hours per flight with a fully charged battery
- **Automated missions** – Powered by ArduPilot with full support for waypoint-based automated flight, reducing operator workload
- **Integrated HD Video and Telemetry** – Herelink ground system delivers live video, RC control, and telemetry in a single digital link

Specifications:

- **Maximum flight time:** > 150 minutes
- **Maximum Takeoff Weight:** 8.5 kg
- **Wingspan:** 2.36 m
- **Control Range:** 20 km
- **Cruise speed:** 18 m/s
- **Maximum speed:** 30 m/s
- **Maximum operating altitude:** < 5 km
- **Maximum wind speed:**
    - 8 m/s (steady)
    - 12 m/s (gust)

3 Safety Information

This section defines mandatory safety requirements for operation of the Brolga UAS.
Failure to comply with these requirements will result in unsafe operation and may lead to serious injury, property damage, or loss of the UAS.

3.1 Safety Warnings

⚠ WARNING
This UAS contains rotating propellers capable of causing severe injury. Never approach the UAS during operation.

⚠ WARNING
The UAS must not be operated within 30 m of personnel.

⚠ WARNING
Only trained and authorised operators may operate this system.

⚠ WARNING
Only accessories and equipment provided and authorised by VeraSys may be used for the operation of the UAS. Using unauthorised accessories can bring serious safety risks and will invalidate the product warranty.

⚠ WARNING
Do not attempt to access the internal components via the rear canopy or payload bay. Doing so will invalidate the product warranty.

3.2 Training

⚠ WARNING
Only trained and authorised operators may operate this system.

Minimum competency includes:

- Successful completion of Remote Pilot Licence Multirotor 25kg training
- Successful completion of VeraSys Brolga UAS training
- Understanding of this manual
- Familiarity with GCS operation
- Ability to execute emergency procedures

VeraSys recommends formal system familiarisation prior to initial operation.

3.3 Operator Responsibility

The operator MUST:

- Operate in accordance with Civil Aviation Safety Regulations (CASR Part 101) and any applicable approvals (ReOC / excluded category conditions)
- Maintain awareness of airspace restrictions and local operating conditions
- Ensure operation only occurs within approved mission profiles
- Maintaining visual line of sight of the UAS and its surroundings
- Confirming the UAS is in an airworthy condition prior to operation
- Operating within the defined limits of the system

Operation outside of these requirements may result in injury, damage, or loss of the UAS.

3.4 Hazards

The operation of the UAS presents a range of safety hazards that need to be addressed and mitigated.

- **Rotating propellers** – Propellers can cause serious injury on contact. All personnel must be at least 30m away from the UAS during operation.
- **Electrical hazards** – Damaged wiring or connectors present risk of burns or electric shock.
- **Fire hazard** – High energy density batteries used in the UAS pose a significant fire risk if not handled and used correctly.
- **Environmental hazards** – Tall trees and structures pose a risk to the UAS and surrounding personnel. The UAS must not be flown in close proximity to such objects.

Operators must assume that misuse, improper assembly, or incorrect configuration can result in uncontrolled flight and system loss.

3.5 Operational Limitations

⚠ WARNING
The UAS must only be operated within validated environmental limits.

Operational limits:

- Maximum Takeoff Weight: 8.5 kg
- Wind (steady): 8m/s
- Wind (gust): 12m/s
- Temperature: 5 - 36°C

If limits are exceeded, safe flight cannot be guaranteed.

3.6 Battery Information

NOTE
Please see the HOTA D6 Pro Manual for the battery charger operating instructions.

The Brolga UAS batteries have the following specifications:

- Chemistry: Solid state Lithium Ion (Li-Ion)
- Maximum voltage: 25.5V (4.25V per cell)
- Minimum voltage: 16.5V
- Storage voltage: 22.8V (3.8V per cell)
- Number of battery cells: 6

3.6.1 Battery Warnings

⚠ WARNING
Lithium batteries present fire and explosion hazards.

⚠ CAUTION
The following must be followed at all times: • **Only use the provided batteries for operation of the Brolga UAS** • **Only use the provided battery charger** • **Do not charge the battery above its maximum voltage** • **Do not deplete the battery below its minimum voltage** • **For long-term storage, ensure the battery is at its storage voltage to maximise its lifespan** • **Do not use a battery if it has visible damage to its surface or if it has visible swelling**

3.6.2 Battery Handling Safety

⚠ WARNING
Lithium batteries present fire and explosion hazards.

The following must be observed:

- Charge only under supervision
- Do not charge near flammable materials
- Store in a cool, dry location away from direct sunlight
- Do not transport if damaged
- Use fire-resistant storage/transport containers where practicable

Batteries must be transported in accordance with applicable dangerous goods regulations.

In case of battery fire:

- Evacuate personnel
- If safe to do so, use large quantities of water to limit thermal runaway
- Contact emergency services
- Do not handle the battery

In case of overheating (and still safe to handle):

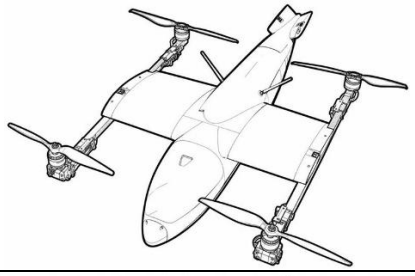
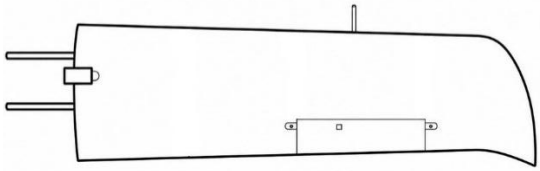
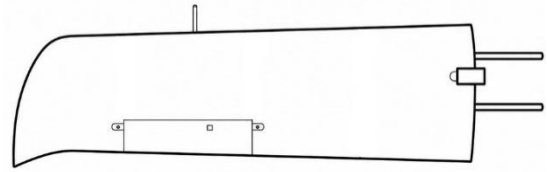
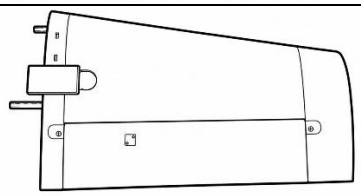
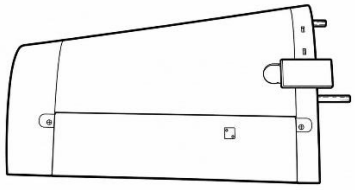
- Disconnect the battery if it is being used or charged
- Submerge the battery in a bucket of water away from personnel, structures and flammable materials
- Monitor the battery from a safe distance

4 Packing List

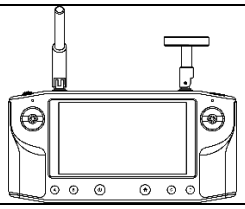
This section includes the equipment required for operation of the Brolga UAS.

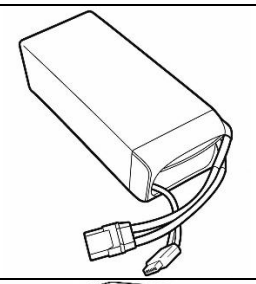
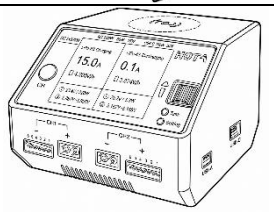
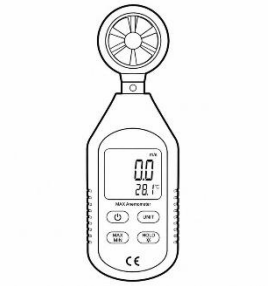
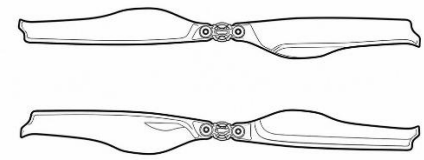
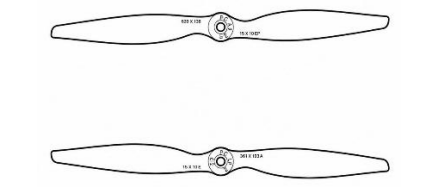
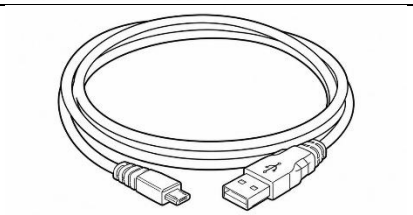
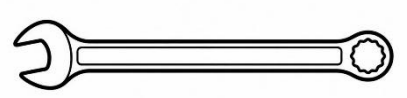
NOTE
Diagrams NOT to scale.

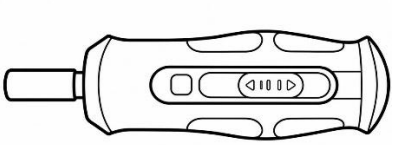
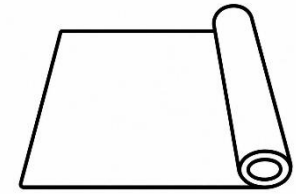
4.1 UAS

	Fuselage (w/ propellers)	1 pc
	Right wing	1 pc
	Left wing	1 pc
	Right tail fin	1 pc
	Left tail fin	1 pc

4.2 Support Equipment

	Herelink Controller	1 pc

	Battery	2 pc
	Battery charger	1 pc
	Anemometer	1 pc
	Aviation radio	1 pc
	Spare folding propeller set	1 pc
	Spare front propeller set	1 pc
	Micro-USB cable	1 pc
	Propeller spanner	1 pc

	Torque screwdriver	1 pc
	Landing mat	1 pc

5 System Configuration Control

The UAS must only be operated using approved:

- Firmware versions
- Parameter configurations
- Payload integrations

Unauthorised modification of system parameters or firmware:

- Voids warranty
- May result in unsafe operation

Product configuration is controlled internally by VeraSys using a documented configuration management system. Changes are reviewed, approved, and recorded to maintain product integrity and traceability.

6 Ground Control System (GCS)

The GCS is the primary interface between the operator and the UAS. It is used to monitor system status and command the vehicle during operation.

The Brolga UAS utilises the Herelink controller as the operator interface. The Herelink is an integrated ground station combining a handheld controller, display, telemetry radio and video downlink into a single device. It enables real-time communication with the UAS.

The GCS software running on the Herelink is QGroundControl (QGC). QGC provides the user interface for displaying flight data such as position, altitude, airspeed and system status as well as planning and uploading missions.

6.1 Controller Layout

The controller contains two joysticks and several buttons that are used for control and flight mode switching.

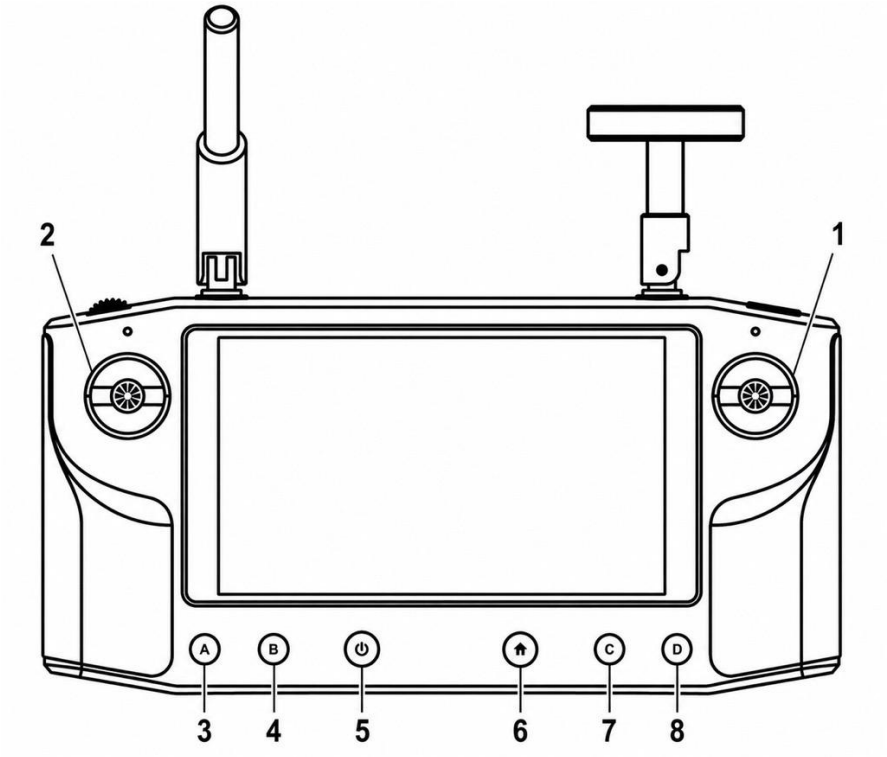


Figure 1 - Herelink controller buttons

1. **Right joystick** – Roll and pitch in non-automated modes
2. **Left joystick** – Throttle and yaw in non-automated modes
3. **A Button** – QLOITER flight mode. The UAS enters VTOL mode and hovers while holding position. Stick inputs will move the UAS
4. **B Button** – AUTO flight mode. The UAS automatically completes the current pre-programmed mission. Stick inputs do nothing in this mode
5. **Power Button** – On/Off button for the Herelink controller
6. **Home Button** – Return to Launch (RTL). The UAS returns to the launch site and lands automatically. Stick inputs do nothing in this mode
7. **C Button** – LOITER flight mode. The UAS begins indefinitely circling around the location when this mode was engaged.

8. **D Button** – Unassigned

6.2 QGC Layout

The “Fly View” in QGC is where the operator will receive all relevant flight data during operation.

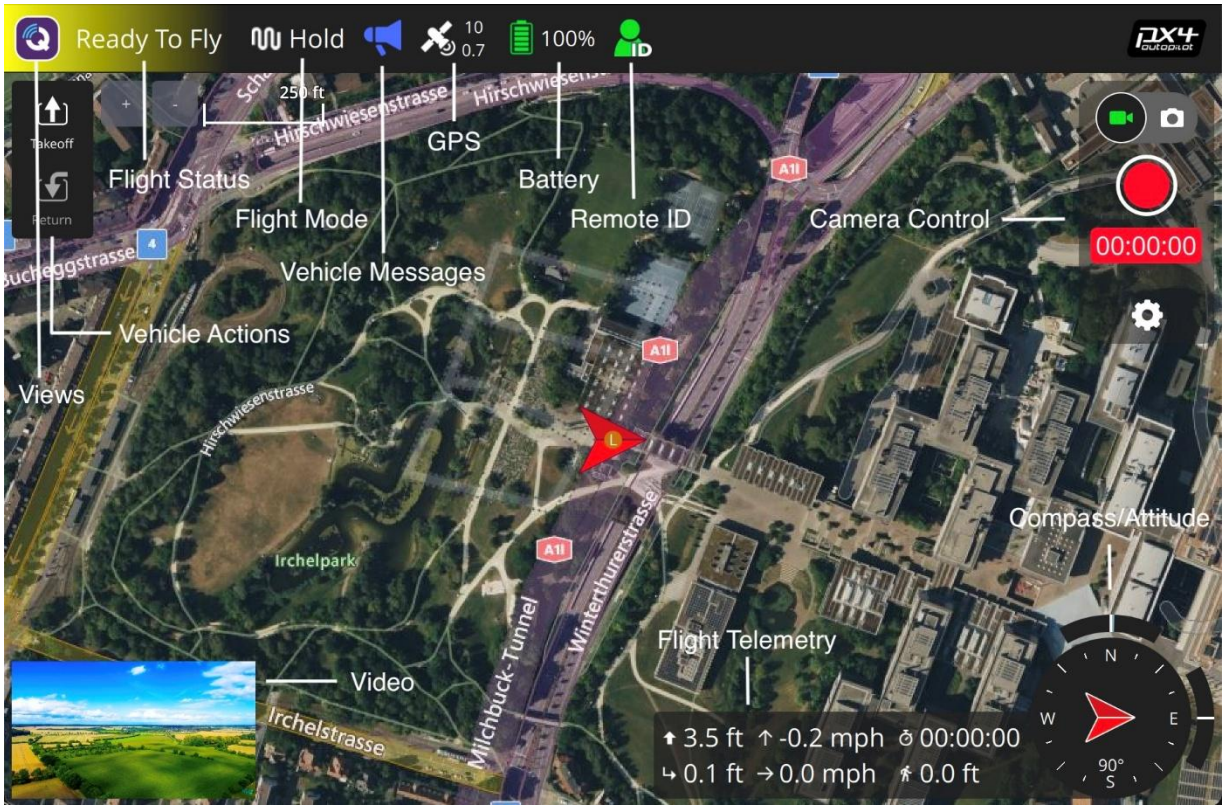


Figure 2 - QGC Fly View layout

- **Toolbar** – The toolbar is located at the top of the screen. It contains flight status, flight mode, vehicle messages, GPS status and battery status
- **Vehicle Actions** – Allows the operator to command the UAS to take specific actions
- Flight data panel – Includes critical flight data like altitude, airspeed, heading and attitude
- **Camera controls** – Enables switching between picture and video mode, starting/stopping capture and controlling camera settings
- **Video** – Located in the bottom left corner. This displays the live video from the UAS. Tapping on the video window allows you to toggle between the video and the map as the main display
- **Map** – Displays the position and the mission waypoints for the connected UAS. The map can be dragged to move it around and pinched to change zoom level

7 Assembly

The following section includes the necessary instructions for assembly. This process must be completed on the provided landing mat or on a table to minimise dirt ingress.

Figure 3 - UAS parts in the transport case

7.1 Attaching the Wings

⚠ CAUTION

Do NOT lift the fuselage or wing pieces by the trailing edge.

1. Remove the fuselage from the transport case and place it level on the landing mat or a clear table.
2. Remove one of the wings from the case.
3. Align the spars with the spar holes on the fuselage side.

NOTE
Spars are the round tubes that protrude from the wings and tail. They are the primary structural elements inside these parts.

4. Insert the wing spars all the way in, ensuring proper alignment. There should be no gap between the two sections.

Figure 4 - Wing insertion

5. Use the latch on top of the wing to secure the wing into place. The top of the latch should sit flush with the wing surface.

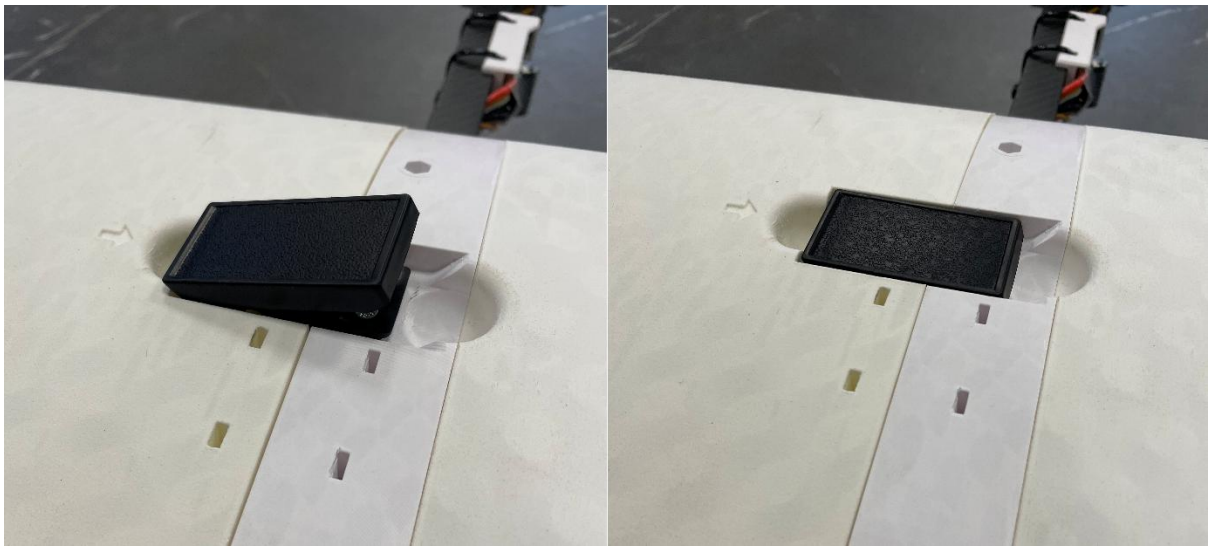


Figure 5 - Wing latch

6. Repeat steps 2-5 for the other wing.

7.2 Attaching the Tail Fins

1. Remove one of the tail fins from the transport case.
2. Align the spars with the spar holes on the fuselage side.
3. Insert the tail fin spars all the way in, ensuring proper alignment. There should be no gap between the two sections.
4. Use the latch on top of the tail fin to secure the tail fin into place. The top of the latch should sit flush with the tail fin surface.
5. Repeat steps 1-4 for the other tail fin.

⚠ CAUTION
Each wing has a pitot probe protruding from the leading edge near the wing tip. Ensure these probes are not bumped or damaged in any way during assembly.

Figure 6 - Assembled UAS, with pitot probes highlighted

7.3 Installing the Front Propellers

⚠ WARNING
Incorrect propeller installation will result in immediate loss of control and possible crash.

Each propeller MUST match:

- Correct motor location
- Correct rotational direction
- Correct orientation (top/bottom)

Do not rely on diagram alone.

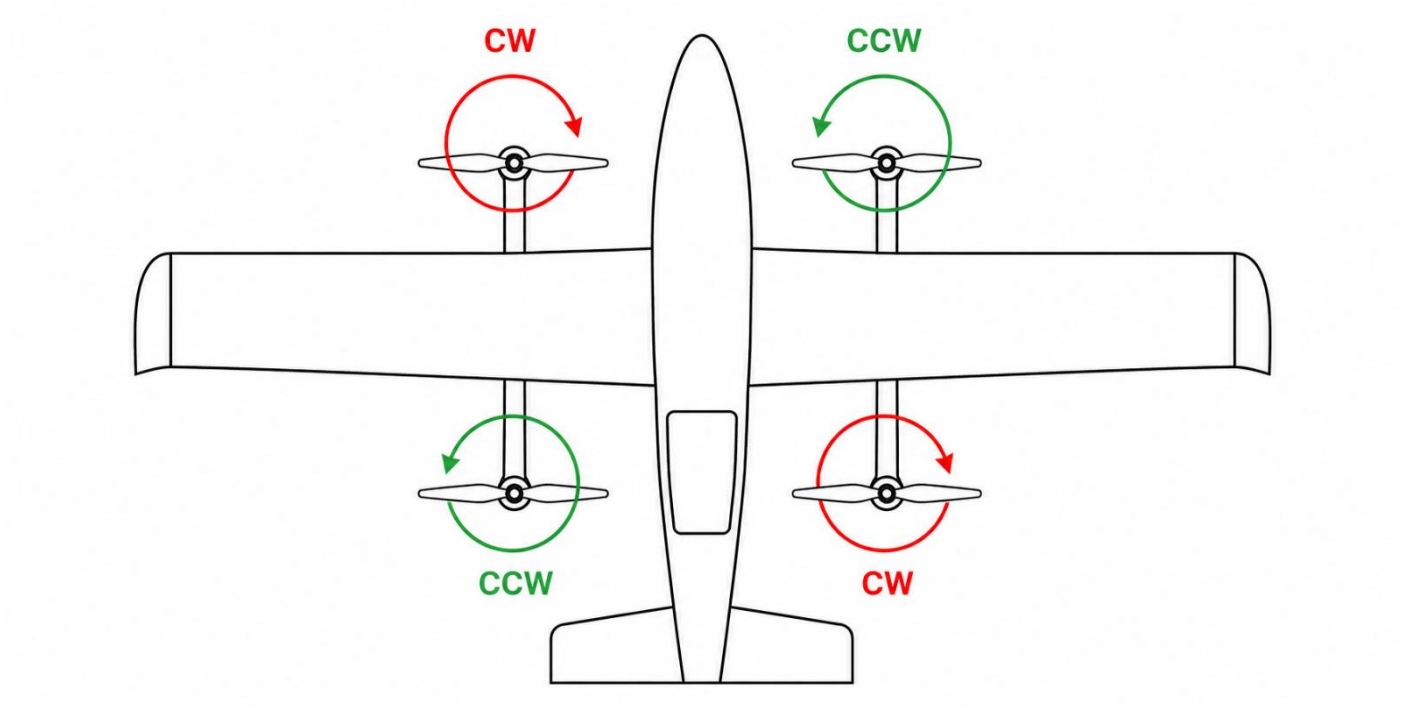


Figure 7 - Propeller directions

1. Undo the nut on one of the front motors and remove it.
2. Remove the washer from the front motor shaft.
3. Feed the motor shaft through the hole in the front propeller ensuring that propeller and motor stickers match colours and both are facing upwards. The propeller should be sitting flush with the thread of the motor shaft protruding through the hole.
4. Install the washer with the grooves facing down towards the propeller.
5. Install the nut and tighten it to finger tight.
6. Use the provided 10 mm spanner to tighten a further 1/3 of a turn.
7. Repeat steps 1-5 with the other front motor.

CORRECT – Both stickers visible and matching colours	INCORRECT – Propeller sticker not visible (propeller upside down)	INCORRECT – Stickers not matching colours
		

7.4 Installing the Battery

⚠ WARNING
Failure to balance and secure the battery properly will result in poor flight performance and may result in a crash.

1. Ensure the front motors are in the tilted-up/VTOL position. This should be true by default after being removed from the transport case.
2. If the motors aren't aligned vertically, they can be gently tilted by hand when the UAS is not powered on.
3. Remove the front canopy.
4. Insert the battery such that the battery connector faces the front per Figure 9.
5. Loosely strap the battery into place and close the front canopy.
6. Using the markers under the wings, lift the UAS off the surface that it's on so it's not touching anything.

Figure 8 - Balance markers under the wing

7. Depending on the battery position, the UAS will likely tilt backwards or forwards.
    a. If it tilts forwards, the battery needs to move rearward slightly.
    b. If it tilts backwards, the battery needs to move forward slightly.
8. Place the UAS down and repeat steps 2-6 until it is balanced and doesn't tilt at all when lifted by the balance points.
9. Once balanced correctly tighten the Velcro straps such that the battery is fully secure.

Figure 9 - Installed battery

8 Planning an Automated Mission

Mission planning is required before any automated flight. It is critical that this process is done correctly in order to ensure safe and efficient operations. Planning a mission is done entirely within QGC. It can be done via the Herelink controller or on a laptop with QGC installed.

8.1 Creating a Survey Mission

1. Navigate to the Fly View in QGC
2. Click the 'Q' menu in the top left corner of the screen
3. Click 'Plan Flight'
4. Select 'Survey' from the menu on the left.

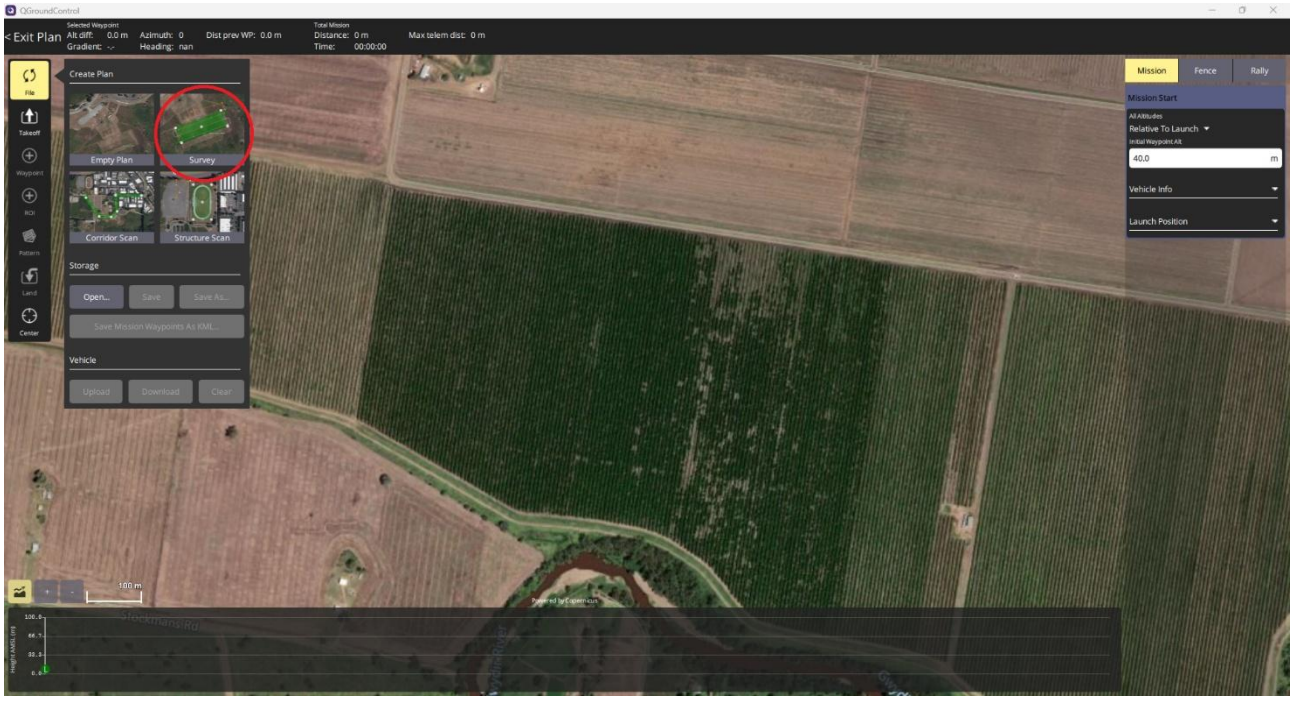


Figure 10 - QGC mission planning

5. The following commands/waypoints should appear in the mission command list on the right
    a. Mission start
    b. Takeoff/VTOL takeoff
    c. Survey
    d. Landing pattern (must be deleted)

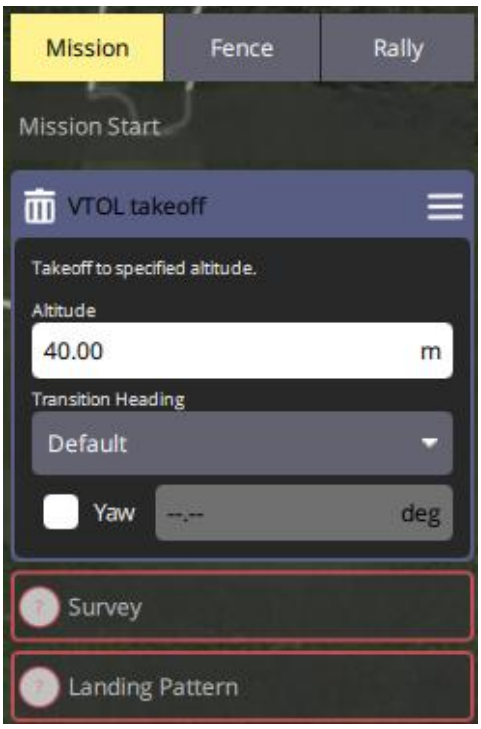


Figure 11 – Initial mission setup

6. Drag the launch waypoint into the desired position
7. Set the altitude to 40m in the 'Mission Start' and 'VTOL Takeoff' commands
8. Use the menu on the left to add a waypoint before the survey command and position it such that it makes the UAS transition into a headwind
9. Click on the survey command and select 'Trace' at the top of the screen
10. Click to place corner points of the survey area until the area becomes green
11. Drag the points to adjust their positioning
12. Click 'Done Tracing'

Figure 12 - Basic survey configuration

⚠ CAUTION
For safety reasons, the survey altitude must not be set to a value lower than 40m AGL.

NOTE
To ensure reliable survey performance, the turnaround distance must be set to 160 metres.

13. Set the desired survey settings:

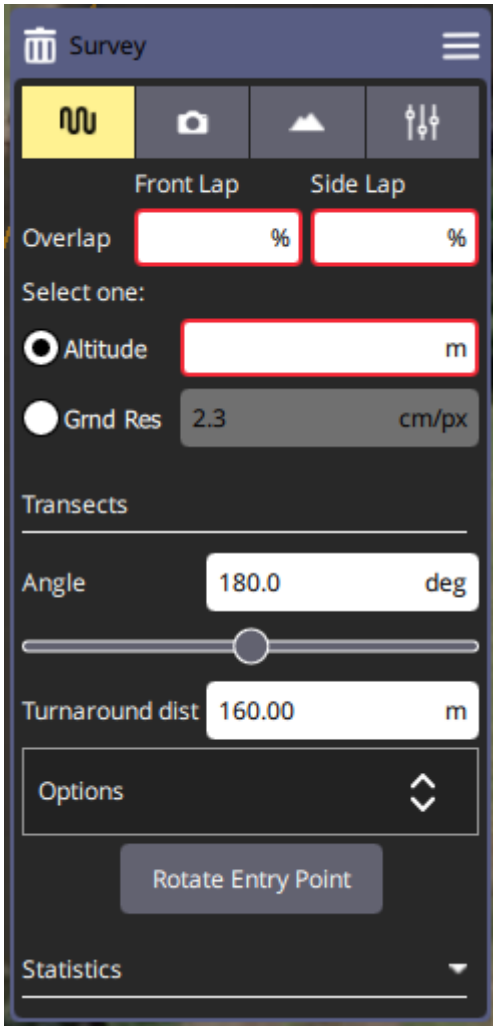


Figure 13 - Survey settings

14. Set the survey angle so that the survey legs are perpendicular to the wind direction
15. Rotate the entry point so that the UAS turns INTO the wind at each turnaround
16. Set the turnaround distance to 150m

NOTE
If the takeoff point is relatively close to the survey area, a 'Loiter (Altitude)' waypoint will be required. This enables a space efficient climb and ensures the UAS is at the correct altitude before commencing the survey. This can be done by

17. Add a waypoint before the survey
18. Click the dropdown on its name in the mission

19. Navigate to the ‘Loiter’ waypoint category
20. Select ‘Loiter (altitude)’
21. Set the altitude of this waypoint equal to the survey altitude

8.2 Setting up a Geofence

1. Click ‘Fence’ above the mission command list
2. Select ‘Polygon Fence’
3. Trace the boundary around the operations area ensuring that the UAS:
    a. Doesn’t accidentally trigger the geofence
    b. The geofence allows sufficient turnaround space outside of it in the event that it does get triggered
4. Check the ‘Inclusion’ box

Figure 14 - Basic Geofence setup

8.3 Setting Camera Parameters

NOTE
Refer to the relevant payload user manual for the camera parameters for that specific payload.

1. Under the ‘survey’ segment of the mission, select the camera symbol
2. Select ‘Custom Camera’
3. Fill out the parameters in the relevant fields:

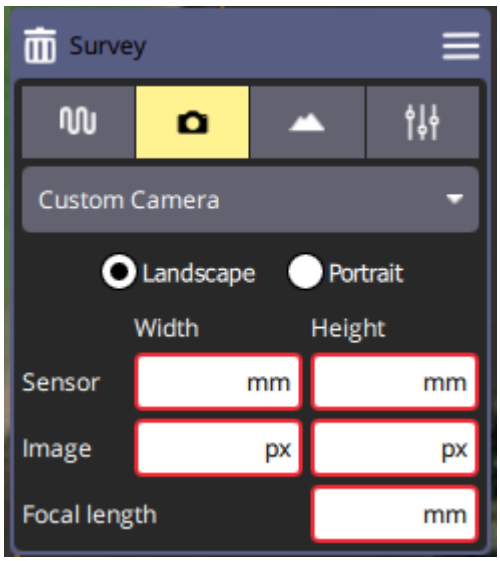


Figure 15 - Camera parameter fields

8.4 Saving the Mission

1. Click 'File' in the left menu
2. Select 'Save As...'
3. Give the plan a name
4. Click 'Save'

8.5 Uploading a Mission to the UAS

8.5.1 Uploading from the Herelink controller

1. Power on the UAS by connecting the battery
2. Wait for the controller to fully establish a connection with the UAS
3. Navigate to the 'Plan Flight' tab
4. Click 'File' in the left menu
5. Select 'Upload' under the 'Vehicle' section
6. The mission is now uploaded onto the UAS

8.5.2 Uploading from a laptop

1. Connect the laptop to the UAS via the micro-USB cable
2. Open the QGC app on the laptop
3. Wait for the laptop to fully establish a connection with the UAS
4. Navigate to the 'Plan Flight' tab
5. Click 'File' in the left menu
6. If the mission is saved, click 'Open' under the 'Storage' section
7. Navigate to the desired mission file and select it
8. Select 'Upload' under the 'Vehicle' section
9. The mission is now uploaded onto the UAS

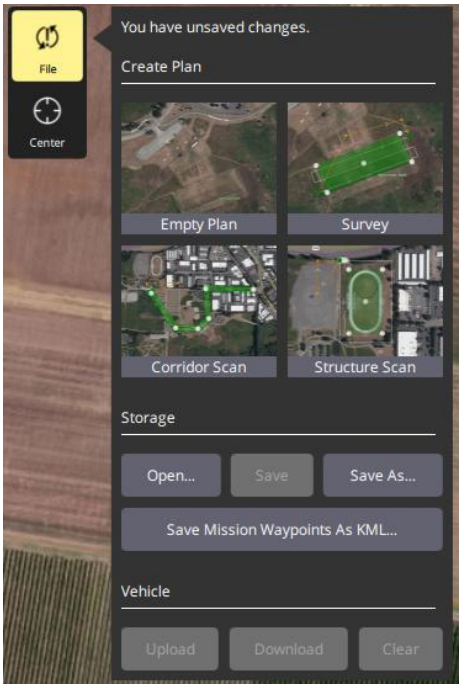


Figure 16 – Mission save/upload options

9 Pre-Flight Procedures

9.1 Pre-Flight Checklist

⚠ WARNING
The UAS must not be operated unless all pre-flight checks are completed successfully.

The UAS must NOT be flown unless all of the following are confirmed:

1. UAS free of structural, wiring, motor and payload damage
    - Visually inspect the frame, arms, propellers, and landing gear to inspect for cracks, dents, or other damage.
    - If no obvious visual damage, gently Run fingers along the frame, arms, propellers, and landing gear to inspect for cracks, dents, or other damage.
    - Visually inspect the motor wiring and connections for any fraying, loose connections, or exposed wires.
    - Lightly spin the motors by hand. They should spin freely with minimal resistance. If a "clunky" feeling is experienced, the motor may be damage or have debris stuck inside. Using compressed air, clean the motors of such debris.
    - Make sure all sensor lenses are clean. Refer to the Payload User Manual.
2. Correct propeller installation (verified against diagram)
    - Check that the propellers are securely attached, in the proper orientation as per 7.3, and installed without damage.
3. Battery securely installed and UAS weight-balanced
    - Ensure that the battery cell voltages are balanced using a battery checker
    - Inspect the battery for any signs of damage, swelling, or leakage.
    - Verify that the battery is fully charged with the battery checker
    - Verify that the battery is securely installed in the UAS.
    - Check that the UAS is correctly weight-balanced with the battery secured
4. No system errors on GCS
    - Check that the Herelink controller has sufficient battery levels and is functioning correctly
    - Ensure no system warnings and errors are present on the Herelink controller
5. Ensure all payload pre-flight checks have been completed (if applicable). Refer to the Payload User Manual

9.2 Power-Up Sequence

1. Place the UAS on level ground on top of the landing mat
2. Turn on the Herelink controller
3. Open the front canopy of the UAS
4. Power on the UAS by connecting the battery to the UAS power plug as shown below. Ensure it is fully plugged in

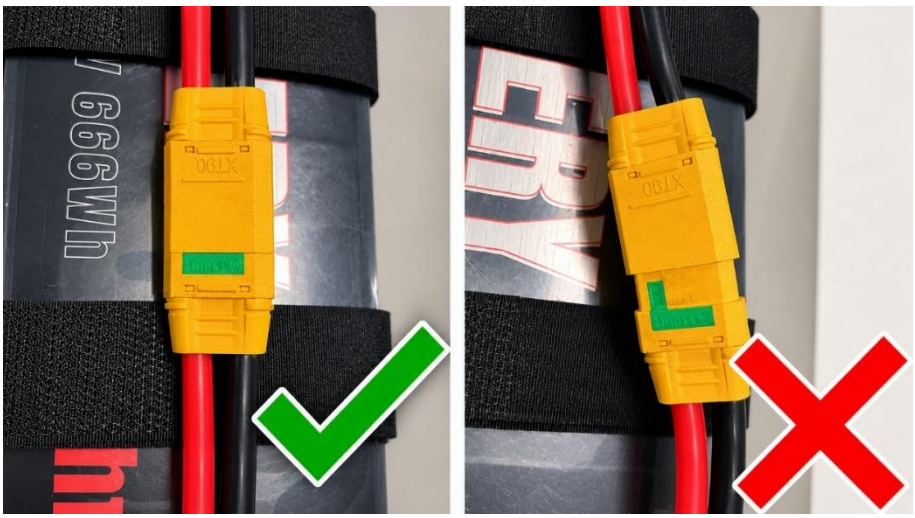


Figure 17 - Correct and incorrect way to connect the battery to the UAS

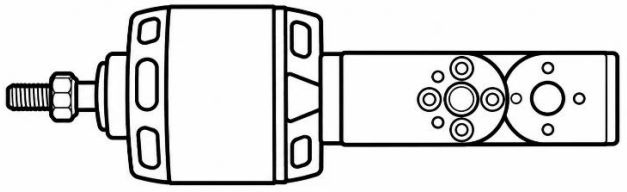
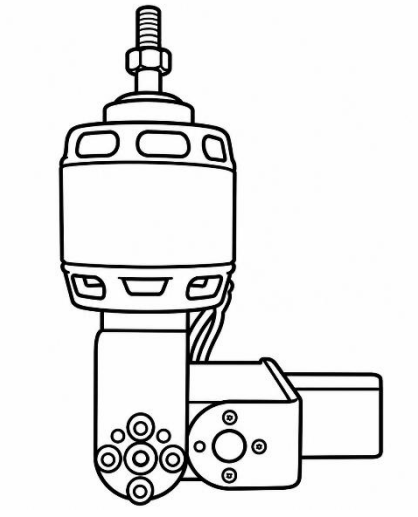
5. Close the front canopy of the UAS
6. Wait until the UAS establishes a connection with the Herelink controller. This typically takes 15-30 seconds

9.3 System Checks

1. Actuate the control surfaces by moving the joysticks on the Herelink controller to verify that they deflect fully and in the correct directions as listed below:

Joystick	Axis	Control surface deflection
Right stick to the right	Roll	Right aileron up, left aileron down
Right stick to the left	Roll	Right aileron down, left aileron up
Right stick down	Pitch	Both tailerons up
Right stick up	Pitch	Both tailerons down
Left stick right	Yaw	Both tailerons right
Left stick left	Yaw	Both tailerons left

2. Switch between QLOITER and Loiter (defined in 10.1) flight modes to verify that the front motors tilt correctly

Fixed-wing orientation	VTOL orientation
	

3. Verify that the airspeed sensor reading is in an acceptable range. It should read no greater than 2m/s in still conditions when stationary on the ground. It is normal for it to read higher in windy conditions.

10 Flight Operations

10.1 Flight Modes Overview

⚠ WARNING

- **The operator must maintain situational awareness at all times.**
- **Automated flight modes do not remove operator responsibility.**
- **The operator must be prepared to intervene at any time.**

⚠ WARNING

Do NOT use LOITER mode unless the UAS is at least 40m AGL.

Flight Mode	Type	Description	Function/Behaviour
QLOITER	VTOL	VTOL Loiter	The UAS will hover and hold altitude/position unless commanded via operator joystick input to move.
AUTO	VTOL/FW	Automated	The UAS will execute the mission that is currently onboard automatically.
RTL	FW	Return To Launch	The UAS will fly towards the launch point and loiter around while descending to 40m AGL. It then exits the loiter facing into a headwind and enters QRTL automatically.
QRTL	VTOL	VTOL Return To Launch	This is the VTOL portion of an RTL. The UAS will transition from Fixed-Wing to VTOL and begin automatically descending until it has landed.
LOITER	FW	Fixed-Wing Loiter	The UAS will perform a Fixed-Wing circle indefinitely around the GPS location at which this mode was triggered.

10.2 Emergency Procedure

⚠ WARNING
Immediate action is required if unsafe behaviour is detected.

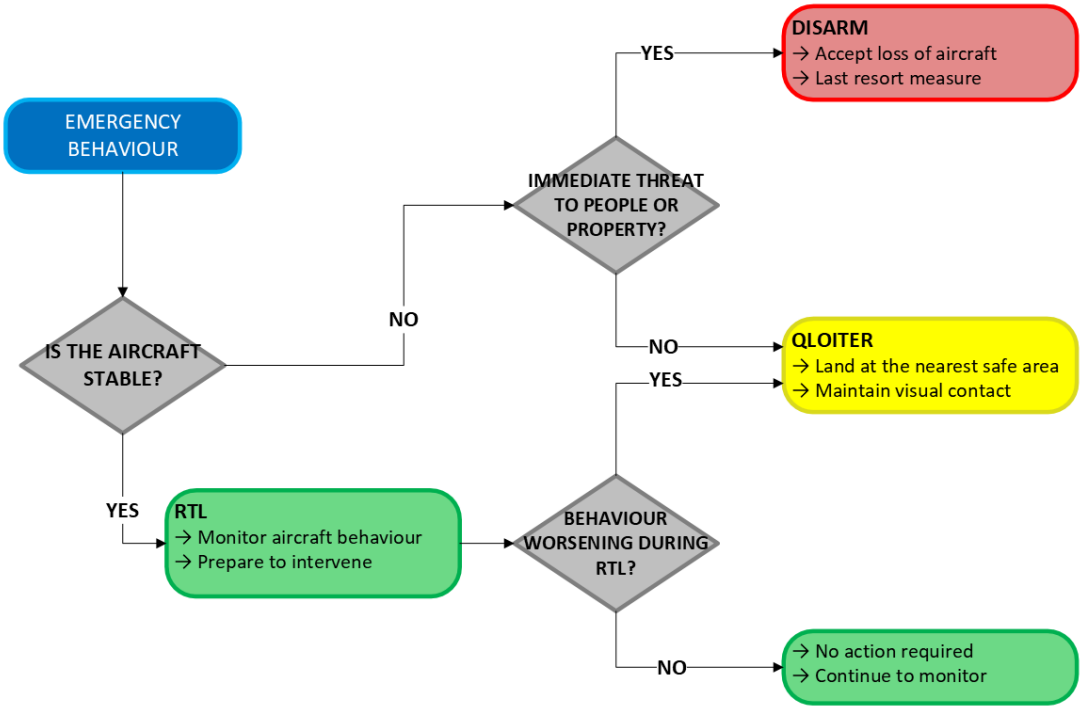


Figure 18 - Emergency decision flow diagram

Priority order:

- Safety of people
- Protection of property
- Protection of UAS

NOTE
Degradation is defined by significant loss of airspeed, altitude, attitude or heading. The operator must be constantly aware of these instrument readings to inform decision making.

QLOITER may be entered before RTL during the following scenarios:

- Major loss of stability during takeoff or VTOL climb phase
- Major loss of stability during VTOL descent and landing phase
- A low flying aircraft enters the operations area - Switch to QLOITER and descend immediately

10.3 Arming

10.3.1 Normal Automated Mission

1. Ensure all pre-flight checks have been conducted
2. Hold the throttle stick down to zero
3. Drag the 'Start Mission' slider to the right to Arm the UAS and initiate the mission

Figure 19 - 'Start mission' slider

10.3.2 Manual VTOL flight

⚠ WARNING
Do NOT manually arm the UAS unless it is in QLOITER mode for manual VTOL flight. Failing to do so can result in damage to the UAS and/or injury to personnel.

In non-mission related scenarios like operator training, the operator may wish to arm and fly in QLOITER:

1. Ensure all pre-flight checks have been conducted
2. Click the 'Disarmed' dropdown in the top right corner of the Herelink screen
3. Click 'Arm'. A slider will appear to arm the UAS
4. Hold the throttle stick down to zero
5. Drag the slider to the right to Arm the UAS. The propellers will begin to spin at low speed
6. Increase the throttle steadily until the UAS lifts off the ground

10.4 Disarming

⚠ WARNING
Manually disarming during flight will result in a crash. Do NOT do this unless absolutely necessary. See Section 10.2 for the Emergency Procedures.

The UAS will disarm automatically after landing following an AUTO mission or RTL.

Manually disarming is only required if the UAS has to be landed in QLOITER or in the event of an emergency where cutting power to the motors is required to prevent injury to personnel or damage to property.

To manually disarm the UAS:

1. Click 'Flying' in the top left-hand corner of the Herelink screen. A popup with the UAS system messages will appear
2. Click the 'Disarm' button. A 'Disarm' slider will appear in the middle of the Herelink screen.
3. Hold the throttle stick down to zero
4. Drag the slider to the right to Disarm the UAS
5. The propellers will stop spinning once disarmed. The UAS is now safe to approach

10.5 Flight Behaviour

10.5.1 Takeoff and Transition to Fixed-Wing

⚠ CAUTION
The UAS must face into a headwind for the takeoff and transition phases of flight.

In AUTO mode, the UAS will take off and perform a VTOL climb directly up until it reaches the transition altitude set in the mission plan.

Once transition begins, the front two motors tilt forward to approximately 45 degrees and the UAS begins accelerating forward as the front motors increase throttle. Once the UAS reaches 15m/s airspeed, the front motors will be fully tilted forward and the rear motors shut down. The UAS is now in Fixed-Wing flight.

10.5.2 Fixed-Wing

Fixed-Wing flight makes up the majority of a mission's duration. During this flight phase, the operator must monitor critical flight telemetry on the Herelink Controller while maintaining visual line of sight:

- **Airspeed** – The speed at which air is flowing over the UASs wings. Normal flight occurs within the following airspeed limits:
    - Minimum airspeed: 15m/s
    - Cruise airspeed: 18m/s
    - Maximum airspeed: 23m/s
- **Altitude** – Altitude is typically measured with the takeoff point as the reference unless terrain following is enabled which would give an altitude reading relative to the ground directly below the UAS.
- **Heading** – The direction that the UAS is pointed on a compass. Under normal conditions, the heading of the UAS should approximately match the heading of the next waypoint. When the UAS is in a crosswind, its nose will point slightly into the wind. This is normal behaviour.
- **Attitude** – Attitude refers to the roll and pitch angles of the UAS. Under normal behaviour, the UAS will not exceed the following attitude limits:
    - Roll limit: ±40°
    - Pitch up limit: 17.5°
    - Pitch down limit: -25°
- **Battery Voltage** – This is the primary indicator of how much charge the battery has left.

10.5.3 Return to Launch (RTL) and Landing

When RTL is initiated either at the end of a mission or triggered by the operator, it will take the shortest path to reach the launch point. The UAS remains in fixed wing until it enters the 120m radius around the launch point. The UAS then begins a clockwise loiter around the launch point while it descends to 40m AGL. It then exits the loiter facing into the wind, transitions into VTOL, descends and lands. The UAS typically climbs approximately 10m as it pitches up to slow down when transitioning. Once the UAS stabilises, it begins descending over the launch point. When the UAS reaches 6m above the launch point, its descent rate reduces and it gently touches down. The UAS will then automatically disarm.

10.5.4 Automatic Crewed Aircraft Avoidance

⚠ WARNING
Automatic crewed aircraft avoidance only functions when the crewed aircraft is transmitting a detectable ADS-B signal. Many low-level aircraft, including agricultural aircraft, helicopters, gliders, and some recreational aircraft, may not transmit ADS-B or may not be detected. ADS-B avoidance must not be relied upon as the primary means of detecting and avoiding crewed aircraft. The remote pilot remains responsible for maintaining separation from all other aircraft.

NOTE
During an avoidance event, the current mission is temporarily interrupted until the collision threat has cleared.

The UAS monitors nearby ADS-B-equipped crewed aircraft and displays detected aircraft on the Fly view map on the Herelink controller. For each detected aircraft, the following information is available:

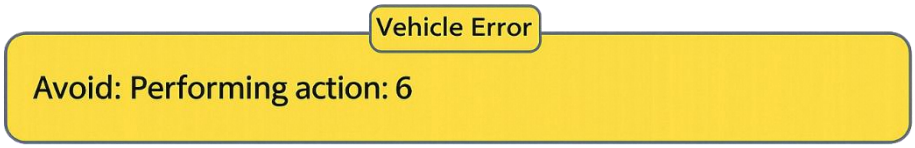
- Position
- Altitude
- Speed
- ID

The UAS continuously evaluates detected aircraft to determine whether they present a collision risk and automatically initiates avoidance if required.

⚠ WARNING
During automatic avoidance, if the UAS remains in a potential collision course with a crewed aircraft, switch the QLOITER, descend and land immediately.

If a collision threat is detected:

- The operator is alerted through visual and audible warnings on the Herelink controller.



- During fixed-wing flight, the UAS performs an automatic avoidance manoeuvre and enters LOITER mode. During LOITER, the UAS continues to adjust its flight path as required to maintain separation from the detected aircraft. Once the threat has cleared, the mission automatically resumes in AUTO. Switching to QLOITER during the avoidance will enable manual override:
- During VTOL flight, the UAS switches to QLOITER and awaits operator input. The operator should immediately assess the situation and manoeuvre or land the aircraft as required to maintain safe separation.

10.6 Failsafes

The UAS has the following failsafes inbuilt in order to ensure safe operation:

- **Low battery failsafe** – When the UAS reaches low battery during flight, it will automatically trigger RTL
- **Geofence** – If UAS flies outside of the designated geofence, it will automatically trigger RTL
- **Radio failsafe** – If the Herelink controller loses connection to the UAS, it will automatically trigger RTL
- **Stall assist** – If the UASs airspeed falls below 14m/s, the rear motors will briefly assist in providing lift to prevent a stall and crash.

⚠ WARNING
If the radio failsafe or stall assist engages, notify VeraSys as this is not typical behaviour.

NOTE
If the UAS shows no sign of abnormal behaviour, it can continue to be operated as normal following a failsafe trigger.

11 Post-Flight Procedures

11.1 Power-Off Sequence

1. Open the front canopy of the UAS
2. Power off the UAS by disconnecting the battery from the UAS power plug
3. Remove the battery
4. Close the front canopy of the UAS
5. Power off the Herelink controller by pressing and holding the power button and selecting ‘Shut down’

11.2 Post-Flight Checklist

⚠ CAUTION
Risk of equipment damage or degraded performance.

1. Visually inspect the frame, arms, propellers, and landing gear to inspect for cracks, dents, or other damage.
2. If no obvious visual damage, gently Run fingers along the frame, arms, propellers, and landing gear to inspect for cracks, dents, or other damage.
3. Visually inspect the motor wiring and connections for any fraying, loose connections, or exposed wires.
4. Lightly spin the motors by hand. They should spin freely with minimal resistance. If a "clunky" feeling is experienced, the motor may be damage or have debris stuck inside. Using compressed air, clean the motors of such debris.
5. Check that the propellers are securely attached and installed without damage.
6. Ensure all payload post-flight checks have been completed (if applicable). Refer to the Payload User Manual.

12 Maintenance Schedule

Regular maintenance is critical for safe and reliable operation of the Brolga UAS. The following table specifies the intervals at which key maintenance tasks must be performed. They should be performed whenever the UAS reaches the specified flight hours or the time period has passed. Whichever comes first.

Item	As Required	15 Hours / Weekly	30 Hours / Monthly	100 Hours / 6 Months	1000 Hours
Compass calibration	X				
Repair punctures	X				
Clean Herelink screen	X	X			
Remove dust buildup	X	X			
Check torque spec		X			
Data log management			X		
Battery health assessment			X		
Flight data log assessment*				X	
Propeller replacement	X			X	
Motor replacement*					X

*Completed by VeraSys technicians

12.1 Maintenance Responsibility

Operator may perform:

- Visual inspections
- Cleaning
- Basic part replacement (propellers)

All other maintenance must be performed by VeraSys or authorised personnel.

12.2 Compass Calibration

If a compass calibration is required, an 'Check mag field' error will be displayed on the Herelink screen, and the UAS will not be able to fly.

NOTE
Compass calibration should be completed outdoors, with good GPS reception and away from large metallic objects/structures.

To calibrate the onboard compasses, complete the following steps:

1. Ensure the battery is strapped into the UAS securely.

2. Ensure the wings and tail fins are not installed for ease of handling.
3. Power on the UAS.
4. Power on the Herelink controller.
5. Wait for the Herelink controller to fully establish a connection with the UAS.
6. Click the ‘Q’ button in the top left corner in QGC.
7. Navigate to ‘Vehicle Configuration > Sensors > Compass’.
8. A small window will appear. Do NOT change any settings.
9. Click ‘OK’ in the top right corner of the window.

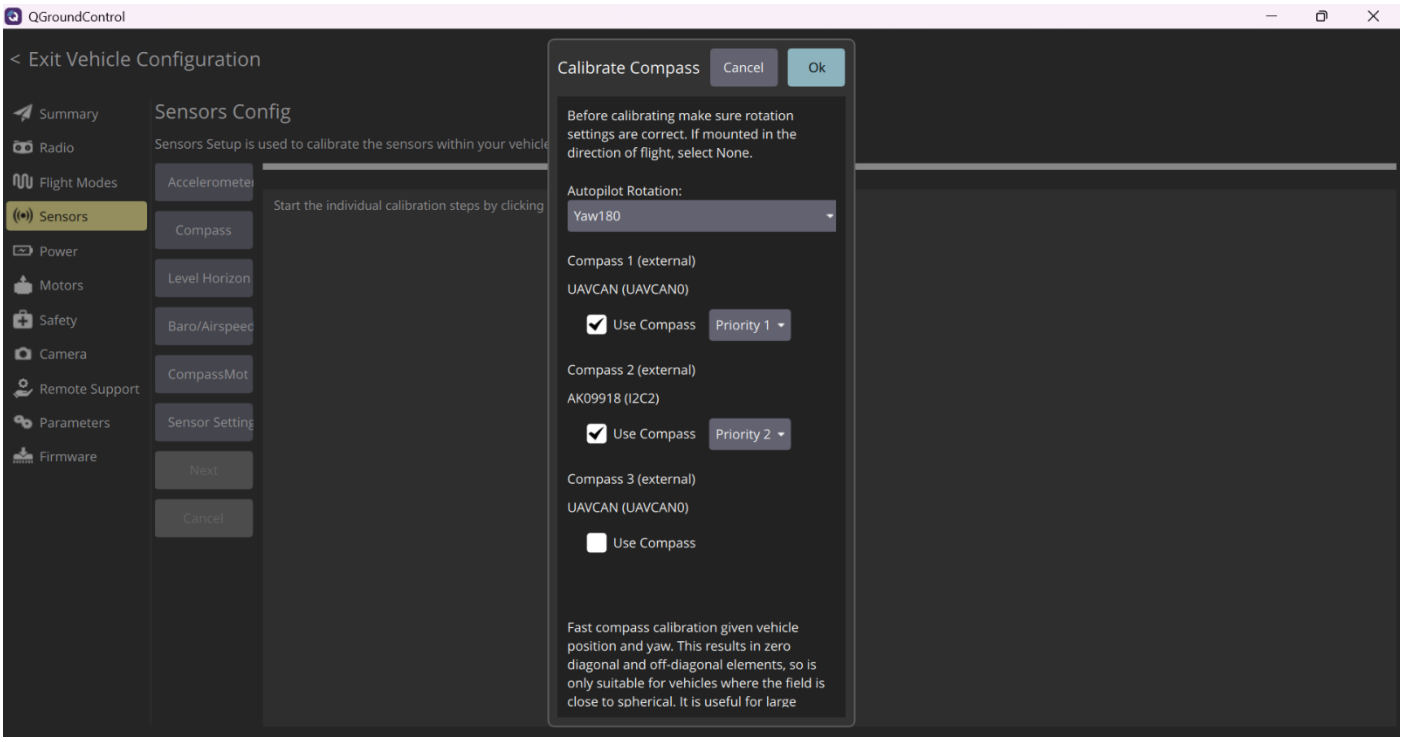


Figure 20 - Compass calibration menu

10. Pick up and rotate the UAS randomly around the following axes until the progress bar fills all the way to the right, indicating that calibration is complete.
    a. Level
    b. Upside down
    c. Left side down
    d. Right side down
    e. Nose down
    f. Tail down
11. Once complete, the results will appear showing the compass health.

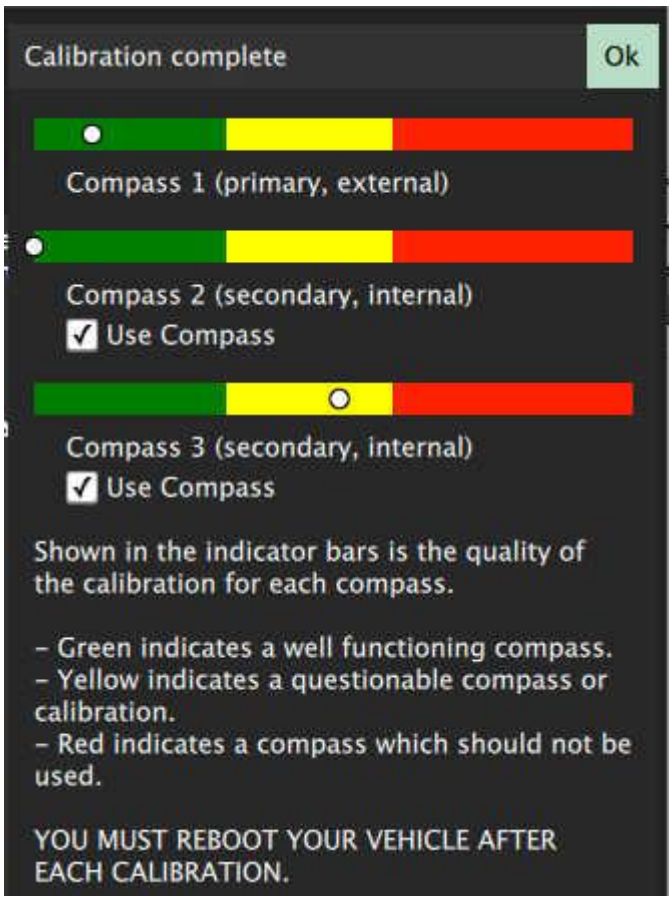


Figure 21 - Compass calibration results

12. If either of the compasses are red, or the primary compass is yellow, repeat steps 1-11. If repeating the process doesn't resolve it, contact VeraSys for support.
13. Click 'Reboot'.
14. Wait 10 seconds and power off the UAS.
15. The UAS is now ready for normal operations.

12.3 Removing Dust Buildup

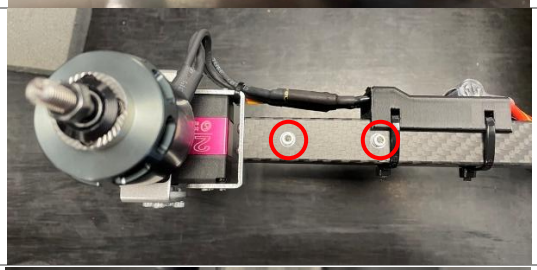
⚠ CAUTION
Do not use high pressure compressed air as it may damage the UAS.

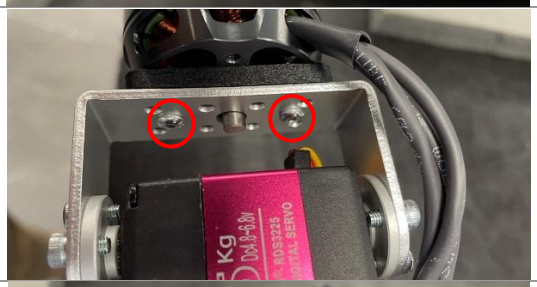
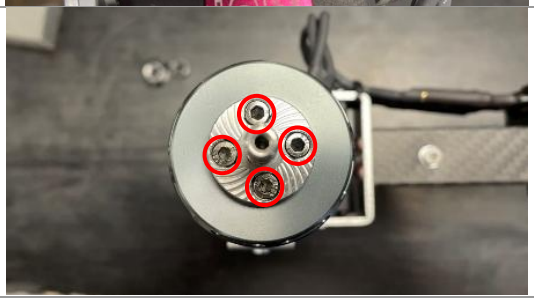
Use an electronic-safe compressed air duster to clean dust build up out of the following locations:

- In the battery bay area
- Motors
- Propellers
- ESCs
- VTOL booms
- Wing/tail latches
- Wing/tail servos

12.4 Checking Fastener Torque

The following table shows which key fasteners require checking. The relevant fasteners are circles in red. Checking torque should be completed with the supplied torque screwdriver. Fasteners that don't require checking the torque should be visibly inspected for loosening

Fastener	Head type	Count	Inspection	
Rear propeller	Hex	8	Torque to spec – 1 Nm	
Rear motor	Hex	4	Visual inspection of markings – Do NOT tighten	
Boom bolts	Hex	4	Torque to spec – 1.5 Nm	
Tilt rotor mount 1	Hex	4	Torque to spec – 1 Nm	
Tilt rotor mount 2	Hex	8	Visual inspection of markings – Do NOT tighten	
Tilt rotor bracket 1	Hex	18	Visual inspection of markings – Do NOT tighten	

Tilt rotor bracket 2	Phillips	14	Hand-tighten	
Front motor screw	Hex	4	Visual inspection of markings – Do NOT tighten	
Front propeller adapter	Hex	8	Visual inspection of markings – Do NOT tighten	

12.5 Managing Data logs

The UAS creates a log for every individual flight and captures all flight data for the entire flight and stores it onboard. These logs are critical for diagnosing system issues if they arise. Data logs for long flights can take up several hundred megabytes. As such, these logs need to be downloaded and stored in order to clear the SD card.

1. Connect a laptop to the UAS via micro-USB.
2. Open the QGC app on the laptop.
3. Wait until QGC establishes a connection with the UAS.
4. Navigate to the 'Q' button in the top left.
5. Click 'Analyse Tools'.
6. The 'Log Download' screen will open by default.
7. Click the 'Refresh' button on the right.
8. Select all of the logs and click 'Download'.
9. When prompted, create a folder and name it with the current date.
10. Click 'Select Folder'.
11. The status of each log download will appear next to each of them.
12. Once all the logs have finished downloading, click 'Erase All'.

12.6 Folding Propeller Replacement

1. Using a 2.5mm hex key, remove the 4 screws that secure it to the motor.
2. Remove the propeller.
3. Take the spare propeller, ensuring that it's the correct direction and insert it onto the motor.
4. Align the mounting holes of the propeller and the motor and insert the 4 screws.

5. Tighten the screws in a diagonal pattern.
6. Repeat steps 1-5 for the other folding propeller if required.

13 End of Life

This section defines the requirements for the safe and responsible decommissioning and disposal of the Brolga UAS and its associated components at the end of its service life.

End of life may be reached due to:

- Accumulated flight hours
- Unserviceable damage
- Obsolescence of components/systems
- Economic impracticality of repair

13.1 Decommissioning

To initiate decommissioning of the Brolga UAS, contact VeraSys and provide the aircraft serial number, current configuration, and reason for decommissioning.

Upon receiving a decommissioning request, VeraSys will provide instructions for preparing and returning the UAS and any associated equipment.

Prior to return, the owner/operator shall:

- Remove the UAS from operational service.
- Retain any flight logs, mission data, and maintenance records required by the owner/operator.

All decommissioning, disposal, recycling, refurbishment, and component recovery activities shall be performed by VeraSys.

14 Warranty

This section defines the warranty coverage applicable to the Brolga UAS system and its supplied components.

VeraSys warrants that the system is free from defects in materials and workmanship under normal use and service for the specified warranty period.

14.1 Warranty Period

Unless otherwise specified, the standard warranty period is:

- UAS (including battery): 1 year/200 hours
- Support equipment: Not covered

The warranty period commences from the date of delivery or first use, as defined by VeraSys.

14.2 Coverage

This warranty covers:

- Defects in materials or manufacturing,
- Failure of components under normal operating conditions, and
- Faults not attributable to operator misuse or external factors.

At its discretion, VeraSys will:

- Repair the defective component, or
- Replace the component with an equivalent item.

14.3 Exclusions

This warranty does not cover:

- Damage resulting from misuse, abuse, or improper operation,
- Operation outside specified limits or environmental conditions,
- Crash damage or impact-related failures,
- Unauthorised modifications or repairs,
- Normal wear and tear, including:
    - Propellers
    - Connectors
    - Wiring subject to fatigue
- Cosmetic damage that does not affect functionality,
- Battery capacity loss due to normal ageing/use,
- Battery damage caused by overcharging or over-discharging,
- Battery damage caused by improper storage, and
- Physical battery damage or swelling.

14.4 Conditions of Warranty

Warranty coverage is conditional upon:

- Operation strictly in accordance with this manual,
- Operation within all specified limits,
- Compliance with all maintenance and inspection requirements,
- Use of authorised components and accessories only, and
- Ensuring that no unauthorised changes are made to the system configuration.

Systems operating on ArduPilot must not have parameters or firmware modified outside of approved configurations unless authorised by VeraSys.

Failure to comply will void warranty coverage.

14.5 Warranty Claims Process

To make a warranty claim:

1. Contact the VeraSys support team
2. Provide:
    a. Description of the issue
    b. Relevant flight logs or diagnostic data (if applicable)
3. Follow instructions provided for return, inspection, or repair

15 Incident Reporting

To promote fleet safety and continuous improvement, operators must report any of the following to incidents to
VeraSys, where product design or quality issues may be involved:

- Crash or uncontrolled landing
- Loss of control event
- Battery failure or thermal event
- Any injury or property damage

Provide:

- Flight logs
- Description of event
- Environmental conditions

The UAS must not be flown if:

- It has experienced a crash or hard landing
- Structural damage is suspected
- Persistent system errors occur

UAS operation may only resume after inspection and clearance to fully serviceable status and aircraft configuration in accordance with this manual.

Continued operation after a serious incident will not be covered under warranty unless the incident has been assessed by VeraSys.

16 Troubleshooting

This section provides guidance for diagnosing and resolving common issues that may occur during operation of the Brolga UAS. It is intended to assist operators in identifying likely causes and corrective actions before escalating to maintenance or support personnel.

16.1 Troubleshooting Approach

If an issue occurs:

1. Observe and record the symptoms
2. Check system status on the GCS
3. Refer to the relevant table in this section
4. Apply corrective actions only if within operator authority

16.2 Flight Issues

Symptom	Possible Cause	Recommended Action
UAS will not arm	Pre-arm checks failing	Check GCS messages and resolve indicated fault
UAS shaking during takeoff or landing	Vibration	Ensure all relevant fasteners are tightened to specification

16.3 Communication Link Issues

Symptom	Possible Cause	Recommended Action
Loss of connection to UAS	Signal interference or range limit	Reposition GCS, verify antenna orientation

16.4 Sensor Issues

Symptom	Possible Cause	Recommended Action
GPS not locking	Obstructed view of sky	Move to open area and retry
Compass error	Magnetic interference	Relocate UAS away from large metallic objects or structures
Airspeed sensor reading high when stationary on the ground	Airspeed sensor didn't zero properly on power up	Disconnect and reconnect the battery

16.5 When to Stop Operation

Cease operation immediately if any of the following occur:

- Loss of stable control
- Repeated failsafe triggers
- Unexplained power instability
- Persistent sensor errors
- Structural or mechanical failure signs

16.6 Support Escalation

If an issue cannot be resolved using this section:

- Download recent flight logs
- Record relevant system messages
- Note environmental conditions when the issue occurred
- Contact VeraSys support team for assistance