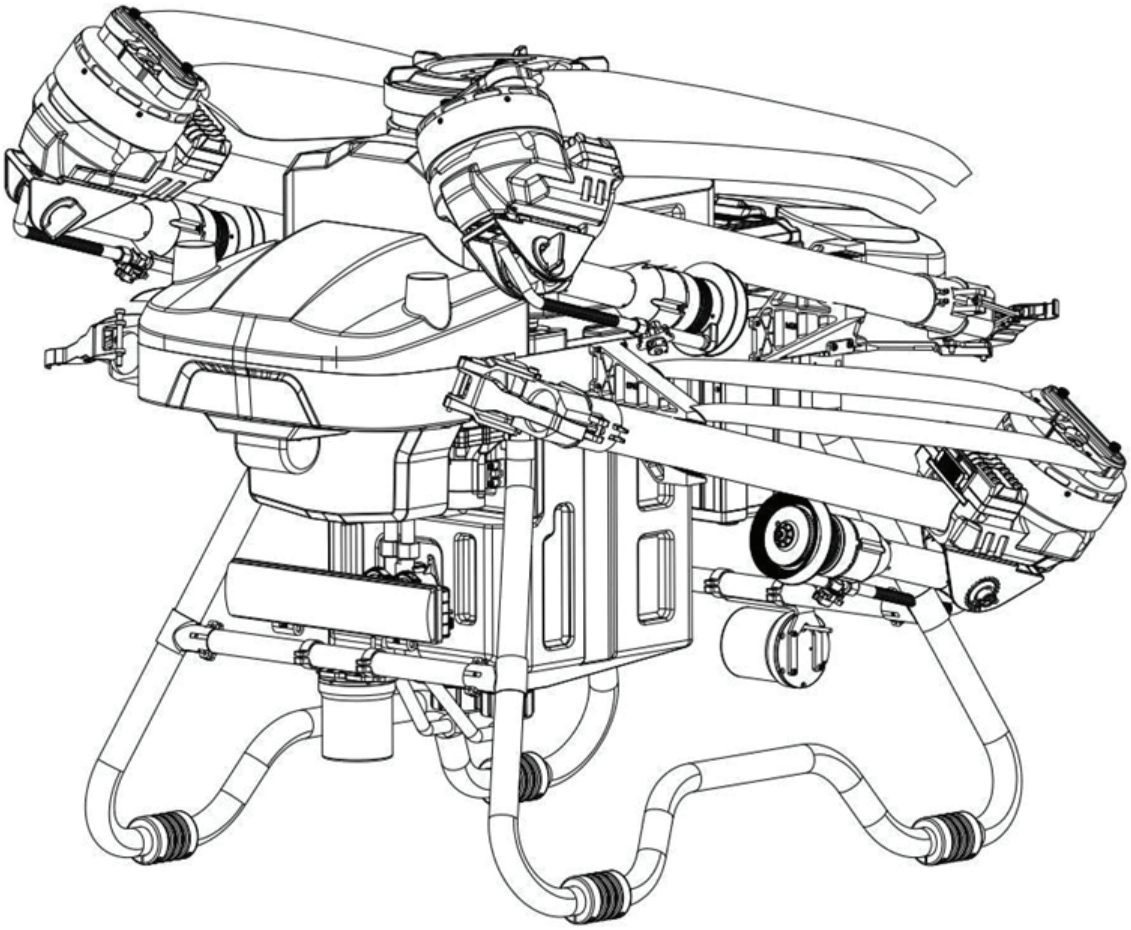
X50 Agricultural **Spray Drone User Manual**

V1.0



Record of manual revisions (tabular format).

Rev. Date	Section	Description

Method for Manual Amendment and Distribution

Revisions will be documented on the revision sheet above.

The Operator, or designee, may update or revise this manual. The Operator will be responsible for any

Manufacturer: DMR Technologies

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Contents

INTRODUCTION

The X50 Agricultural Spray Drone is a highly advanced multi-rotor drone. In terms of functionality, appearance, control, and safety, it has achieved industry-leading standards. However, due to the nature and structure of multi-rotor drones, this product carries inherent risks and potential hazards. Therefore, users must strictly follow the safety instructions and operational guidelines in this manual. Failure to comply may result in direct or indirect losses or harm.

DISCLAIMER

1. Users not assembling or using the product according to this manual.
2. Users operating the drone under the influence of alcohol, drugs, fatigue, or in a physically or mentally unfit condition.
3. Users deliberately operating the drone to cause harm.
4. Users using parts not manufactured by DMR or modifying the product from its original condition,
5. Damage caused by user errors or misjudgment.
6. Damage caused by natural wear, aging of circuits, or abnormal functioning of the drone.
7. Users operating the drone when they know it is malfunctioning.
8. Operation of the drone in extreme weather conditions such as, but not limited to, typhoons, hail, rain, fog, within 5 miles of thunderstorms, or beyond any weather limitations contained in this manual.
9. Flying the drone in areas with magnetic interference, radio interference, or government- designated no-fly zones.
10. Operating the drone when visibility is poor or in obstructed view conditions.
11. Using this product for illegal activities or to obtain any data or images that result in invasions of privacy or infringement.
12. Other losses not within the company's liability.
13. Using this product not in compliance with the aviation laws of the jurisdiction where the aircraft is being stored and operated.

INTELLECTUAL PROPERTY

ABOUT THIS MANUAL

This manual serves as a guide for users. The photos, graphics, and illustrations provided are for explanatory purposes only and may differ from the actual product. Please refer to the actual product.

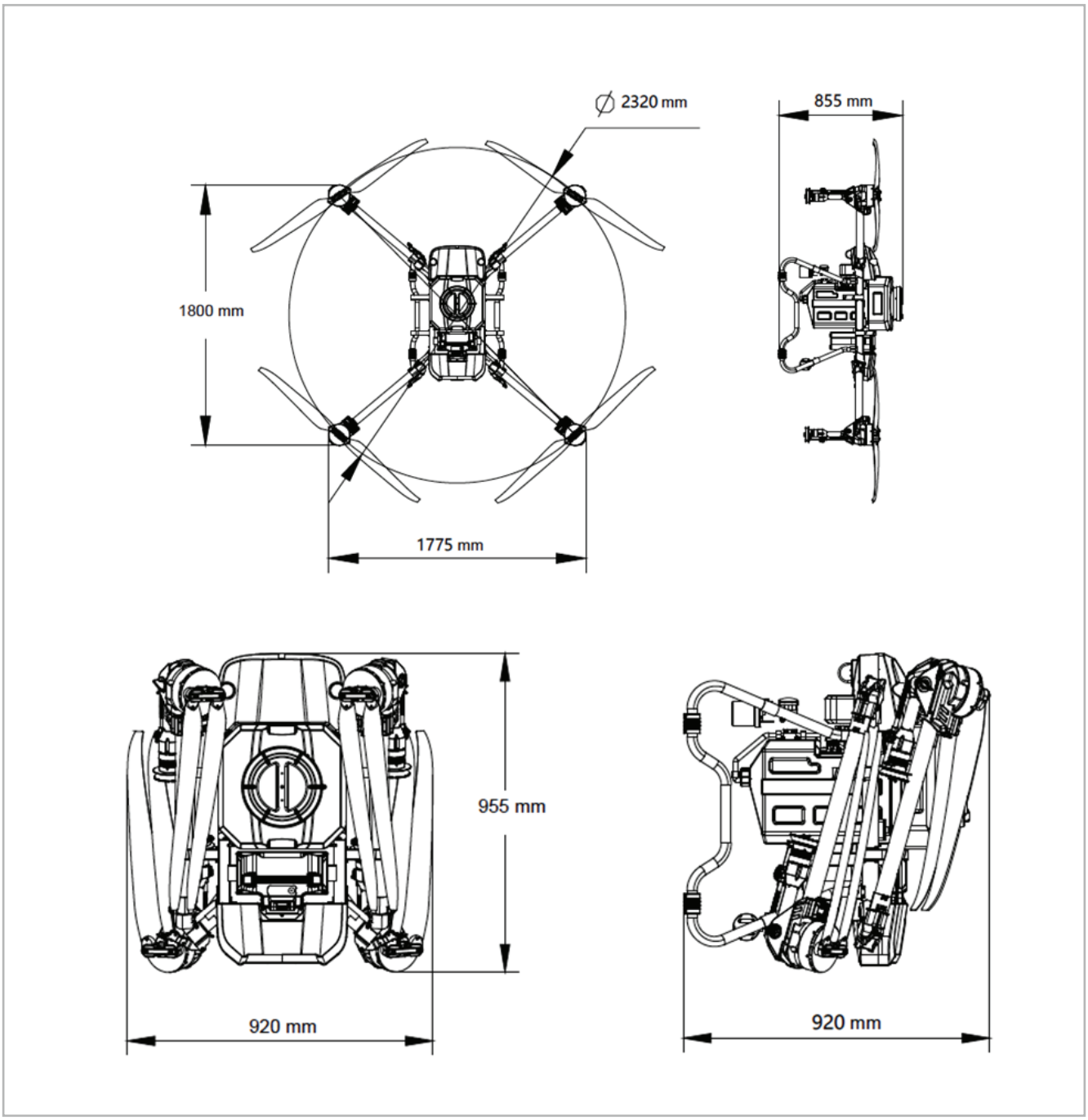
Due to product updates or other reasons, the contents of this document will be updated periodically without further notice. Please read this manual carefully before using the product. To find the latest up-to-date version of this manual, please go to dmrrobotics.com

1 GENERAL INFORMATION AND SYSTEM DESCRIPTION

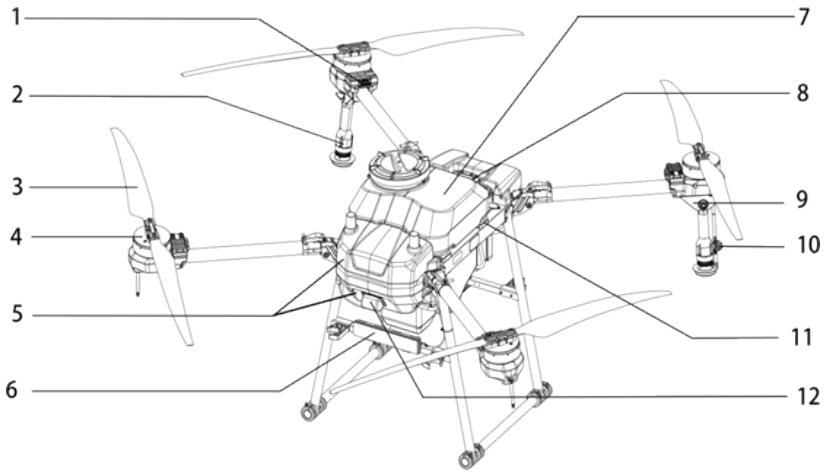
1.1 SYSTEM DESCRIPTION

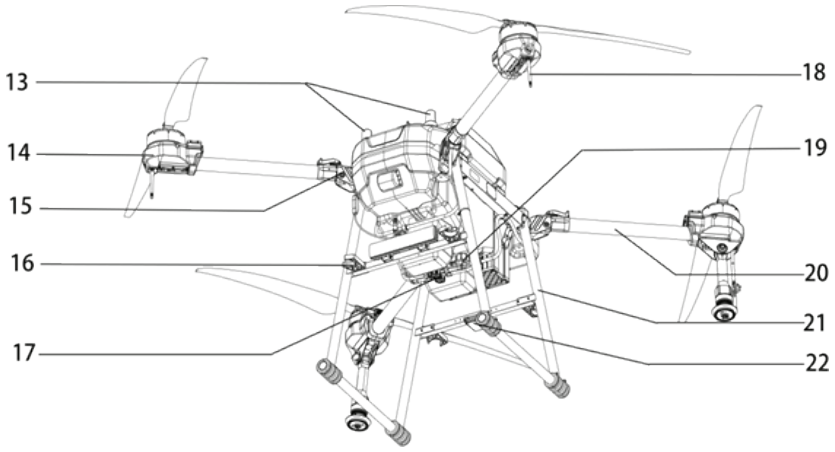
1.1.1. The X50 Agricultural Drone is a convenient, efficient, and economical fold-able drone designed specifically for agricultural use. The down-wash airflow generated by the rotor blades helps with the penetration of the pesticide into the crops, resulting in excellent pest control. The drone features a convenient wrap-around body design and modular maintenance structure. Its dual-pump precision metering spraying system supports one-click configuration for field applications. Additionally, it is equipped with an FPV (First-Person View) camera and obstacle avoidance system, making spraying operations simple and safe. The drone also supports a smart data platform, which efficiently transmits operational data through a 4G high-speed network, enabling real-time monitoring and control via the back end system.

1.1.2. The X50 agricultural drone is made from carbon fiber, making it lightweight and strong. Its foldable arm design allows for easy transportation. The drone can be controlled using a remote controller or through the mobile ground station APP for autonomous flight and spraying tasks. Equipped with high-performance brushless motors, it has a long lifespan. It also includes an onboard RTK module, GPS, and IMU sensors for precise pesticide spraying. The drone is compatible with the ground station system, which generates intelligent flight paths for fully autonomous pesticide spraying operations, reducing operator workload. The drone is quick to prepare for takeoff, highly efficient, and has a high utilization rate, with one- key takeoff and fully autonomous operations. It complies with national energy-saving and green agricultural development requirements, with easy maintenance and low operational and upkeep costs.


∅ 2320 mm
855 mm
1800 mm
1775 mm
955 mm
920 mm
920 mm

Component
1. Electronic Speed Controller
2. Centrifugal Nozzle
3. Propellers
4. Motors
5. Enclosure
6. Spotlights
7. Spray Tank
8. Battery
9. Centrifugal Nozzle Base
10. Pressure Relief Valve
11. Load Cell
12. FPV
13. Onboard D-RTK antennas
14. Motor Protective Case
15. Arm Folding Parts
16. The arm fixed parts
17. Flowmeter
18. Data Link Antenna
19. spray Tank outlet
20. Frame Arms
21. Landing Gear
22. Terrain Following Radar





1.2 USE OF PESTICIDES

- When using pesticides, always wear protective gear to avoid direct contact with the chemicals.
- Strictly follow the safety instructions provided by the pesticide manufacturer.
- Avoid using powdered pesticides, as they can reduce the lifespan of the spraying system.
- When mixing pesticides, use clean water to prevent clogs. Do not remove any filters, and if they become clogged, clean them before continuing to use the machine.
- After operation, promptly clean any remaining pesticide solution. Do not contaminate rivers or drinking water sources to ensure no harm is caused to people, animals, or the environment.
- The effectiveness of pesticides depends on factors like concentration, spray rate, flight speed, height from crops, wind direction, and wind speed. All of these factors should be considered when using pesticides to achieve the best results.

1.3 OPERATING ENVIRONMENT

- Unless otherwise authorized by aviation authorities, fly in open areas away from crowds.
- It is recommended to fly below 40 feet above ground level (AGL)
- Indoor flight is strictly prohibited.
- Fly in temperatures between 0°C and 40°C.
- It is recommended to operate in environments with wind speeds below 8m/s.
- Do not fly in rain, fog, snow, or other extreme weather conditions.
- Steel-reinforced buildings may interfere with the compass and block GPS signals, making positioning less accurate or even impossible.
- Ensure there are no high-voltage lines, communication base stations, or transmission towers near the operation area to avoid electromagnetic interference.
- Unless otherwise approved by the aviation authority, always maintain visual line-of-sight with the drone and avoid obstacles, crowds, and livestock.
- Fly in legal areas. Consult local aviation authorities before flying to ensure compliance with local regulations.

2 PERFORMANCE AND LIMITATIONS

2.1 SPECIFICATIONS

Parameter	Values
Frame Dimensions	• Symmetrical motor axle distance: 2350mm • External dimensions: 2090 × 1830 × 775mm (excluding spray arms and propellers)
Propellers	• Material: Carbon Fiber • Diameter: 56 inches
Max Takeof Weight	150kg (330.69 lbs.)
Normal Operating Weight	108kg (238.09 lbs.)
Max Flight Speed	10 m/s (22.36MPH)
Max Wind Limit	8 m/s (17.89MPH)
Max Spray Altitude	40 feet Above Ground Level (AGL)
Battery Type	18S Li-Ion, 76.5V, 30,000mAh
Battery Weight	13.5kg (29.76 lbs.)
Battery Lifespan	500 cycles
Flight Endurance	20-30 minutes (typical)
Spray Tank Capacity	50L (13.20 Gallons)
Centrifugal Nozzles	2 or 4
Max Nozzle Flow Rate	2 or 4
Max System Flow Rate	24L/min
Spray Width:	6-12m (19.6ft.- 39.37ft.) depending on crop height and type
Obstacle Radar Range	Detects obstacles within 2–12 meters in front and rear of the drone. Important! Radar system may have trouble detecting small/thin objects like small branches, twigs, or grass.
Terrain Following Radar Range	FMCW modulated, 24GHz, height range 1–10 meters, accuracy 0.2 meters

Prohibited Maneuvers: No inverted flight; joystick outward motion disables motors.

Environmental limits: 0-40^0, <85% RH, No rain/fog, Terrain slope < 25^0

2.2 FLIGHT RESTRICTIONS AND LOCAL REGULATIONS

- Visit the Federal Aviation Administration (FAA) website: http://www.faa.gov to access the latest drone no-fly zone list.
- The maximum flight altitude should not exceed 20 meters. Before taking off, consult the local flight management department to ensure compliance with local laws and regulations.

2.3 SPECIAL NOTES

Safety instructions include, but are not limited to, the items mentioned below.

2.3.1 Operational Environment Requirements

2.3.1.1 Avoid flying in extreme weather

Do not operate the drone in conditions of high wind (8 m/s or higher), rain, snow, fog, or other adverse weather. Do not operate the drone within 5 miles of thunderstorms.

2.3.1.2 Open spaces

Choose an open space with no tall buildings nearby. Steel-reinforced buildings can interfere with the compass and block GPS signals, which may result in poor positioning or even loss of positioning.

2.3.1.3 Maintain line-of-sight

Unless otherwise approved by the aviation authority, always fly the drone within your visual line-of-sight, keeping it away from obstacles, people, and livestock.

2.3.1.4 Electromagnetic interference

The operation area should be free from high-voltage power lines, communication base stations, or transmission towers that can cause electromagnetic interference.

2.3.1.5 Good GPS signal

Ensure that the GPS signal is strong before beginning the operation.

2.3.1.6 Do not fly indoors

Indoor flying is strictly prohibited

2.3.1.7 Polar regions

In the polar regions, both GPS and compass functions may fail. In such cases, use attitude mode for flying.

2.3.1.8 Flight Restrictions and No-Fly Zones.

According to the regulations of the International Civil Aviation Organization (ICAO) and the air traffic control authorities of various countries, drones must operate within designated airspaces. To ensure flight safety, flight restrictions are enabled by default, including height and distance limits as well as no-fly zones, helping users fly the drone safely and legally.

When the drone has GPS signal, the no-fly zones and altitude/distance limits jointly affect the flight. The available airspace is determined by the intersection of all restricted airspaces. If the drone does not have GPS signal, altitude limits set in the app will not apply.

2.3.1.9 Altitude Limit

Limits the maximum flight altitude. The drone cannot exceed the maximum altitude set in the flight app.

2.3.1.10 Radius Limit

The distance between the drone and the home point cannot exceed the maximum radius set in the flight app.

When GPS is available, if the drone crosses the set boundary due to inertia, the remote controller will still have control, but you cannot push the drone further. If the drone is outside the maximum radius and regains GPS, it will automatically return to within the set boundary.

2.3.1.11 No-Fly Zones and Restricted Areas

Includes restricted flight areas around airports and special restricted zones. For details, refer to the specific rules for restricted areas.

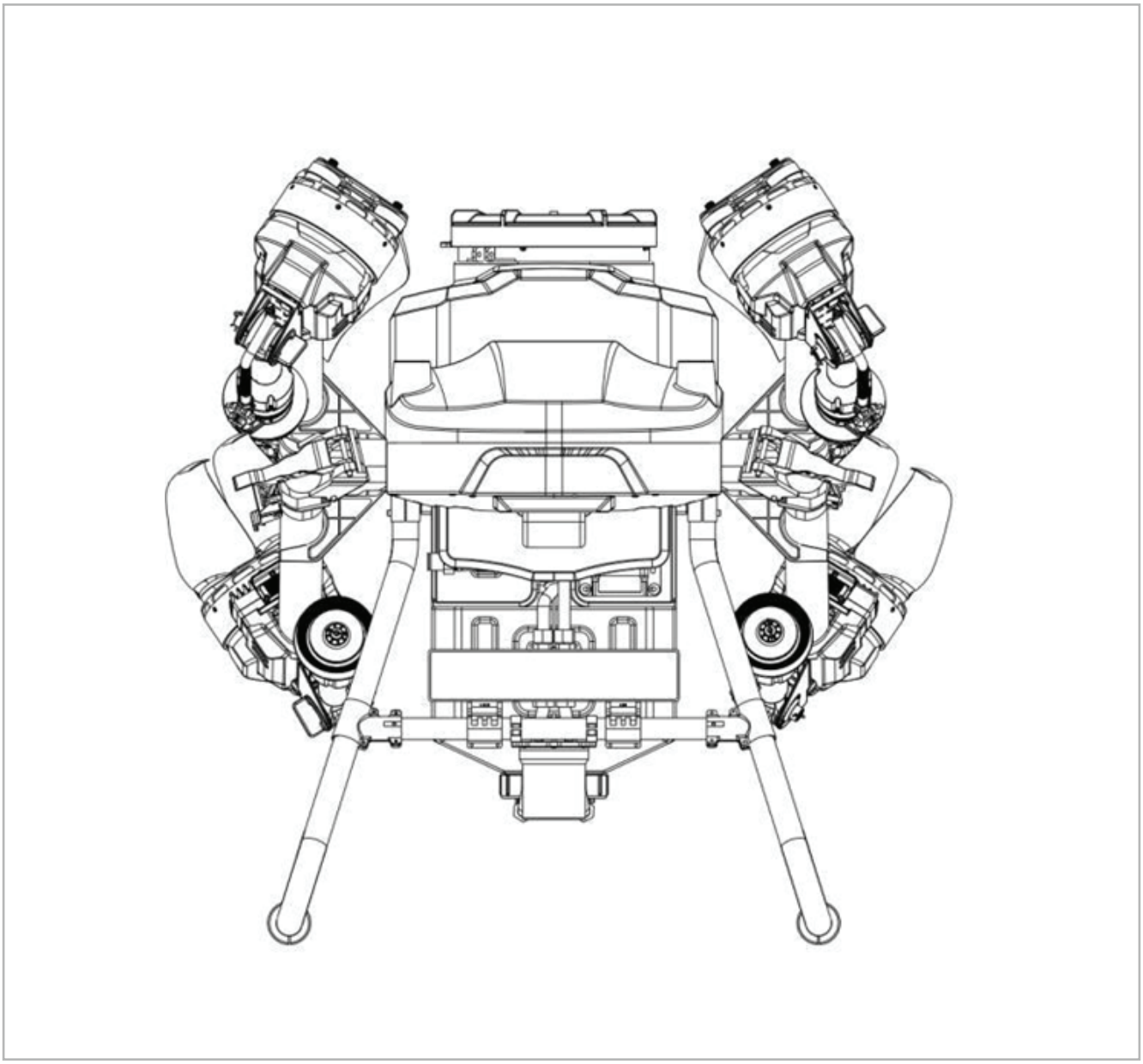
3 NORMAL PROCEDURES

3.1 ASSEMBLY

3.1.1 Preparing for Flight

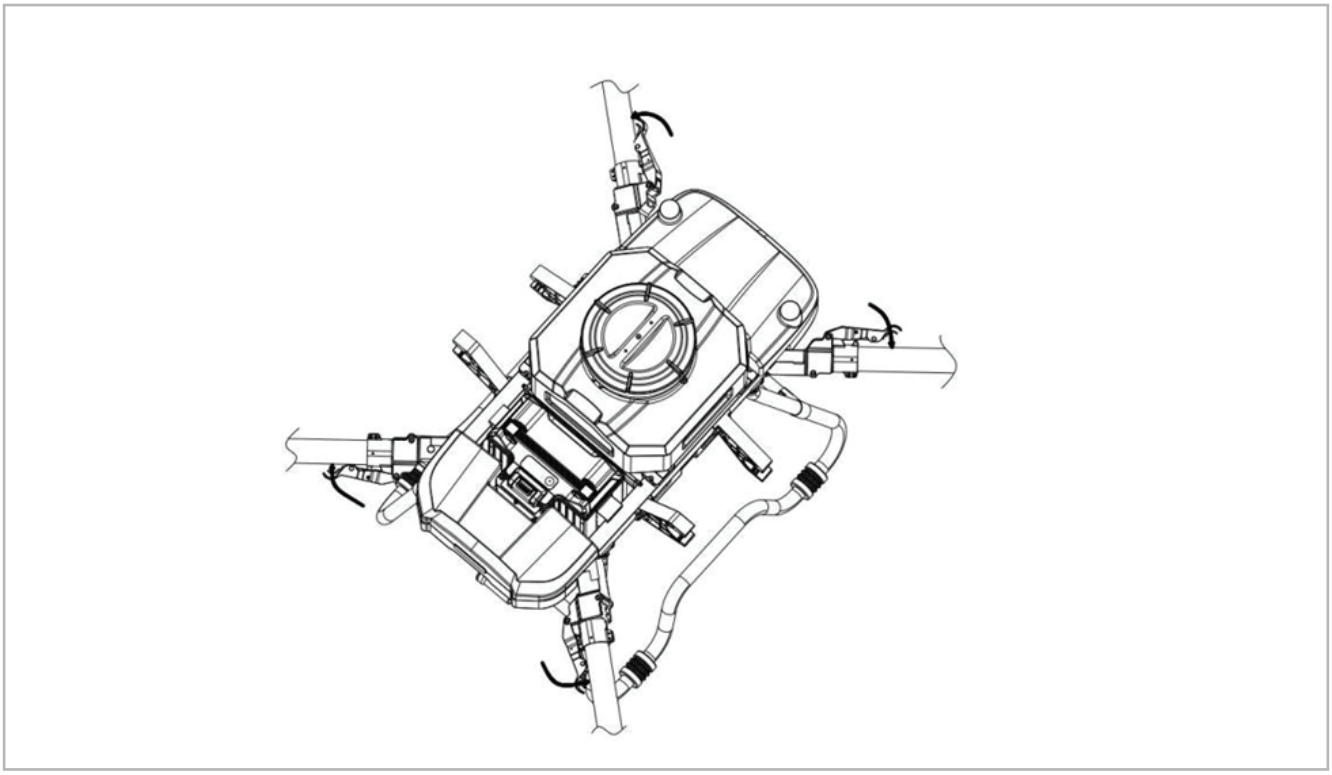
3.1.1.1 Before unfolding the arms

Check all parts to ensure they are intact and correctly installed



3.1.1.2 Unfold the arms

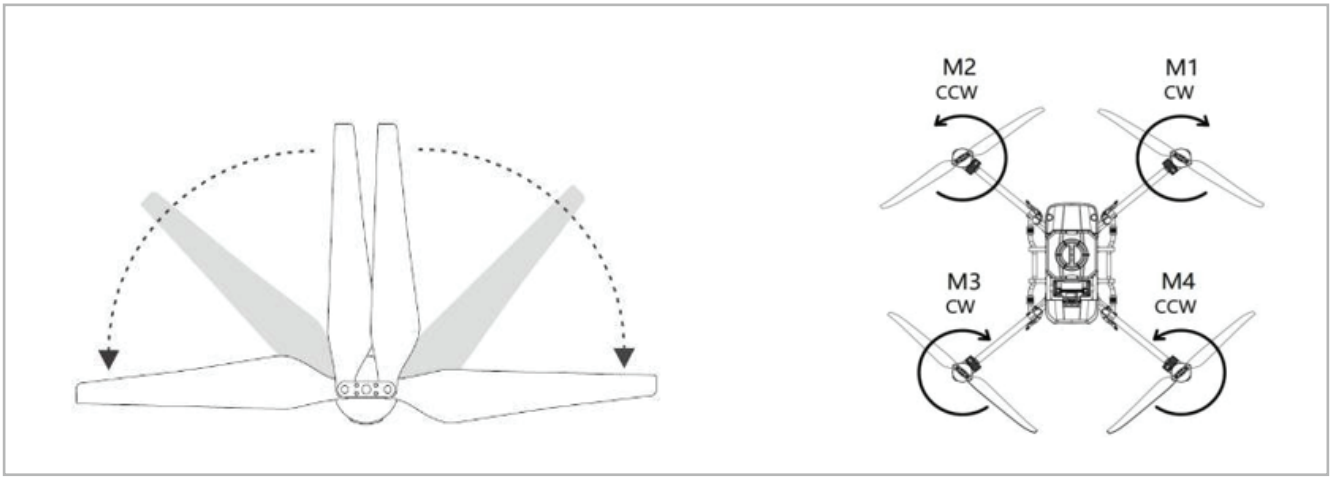
Press the handle until you hear a "click," indicating the arms are securely in place.



3.1.1.3 Propeller Blades

The propeller blades are foldable and can be easily unfolded to 180°.

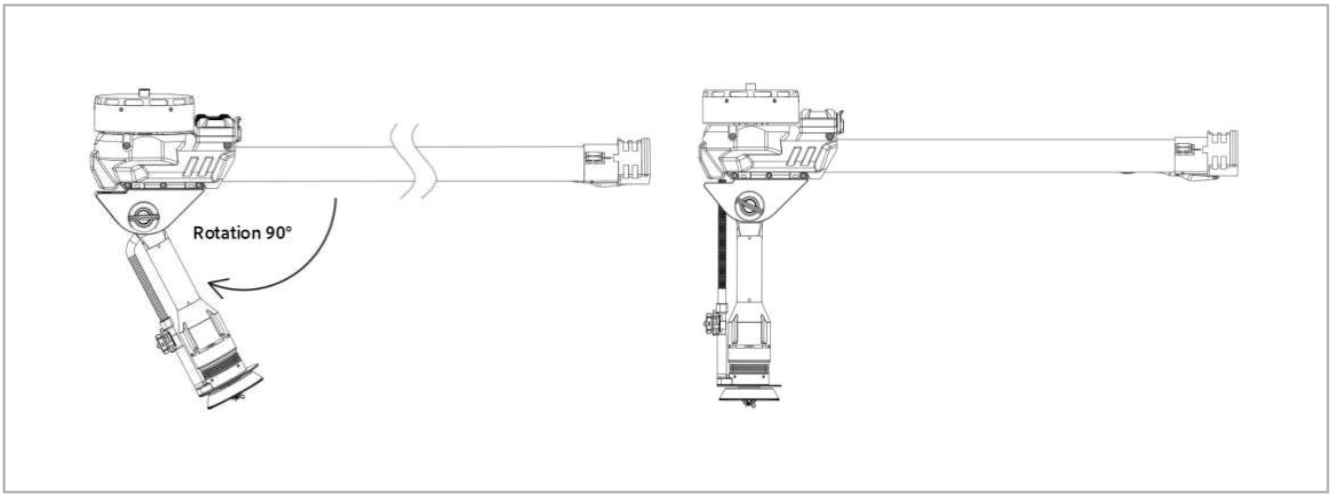
Figure shows propeller rotation direction.



3.1.1.4 Centrifugal Spray Nozzle

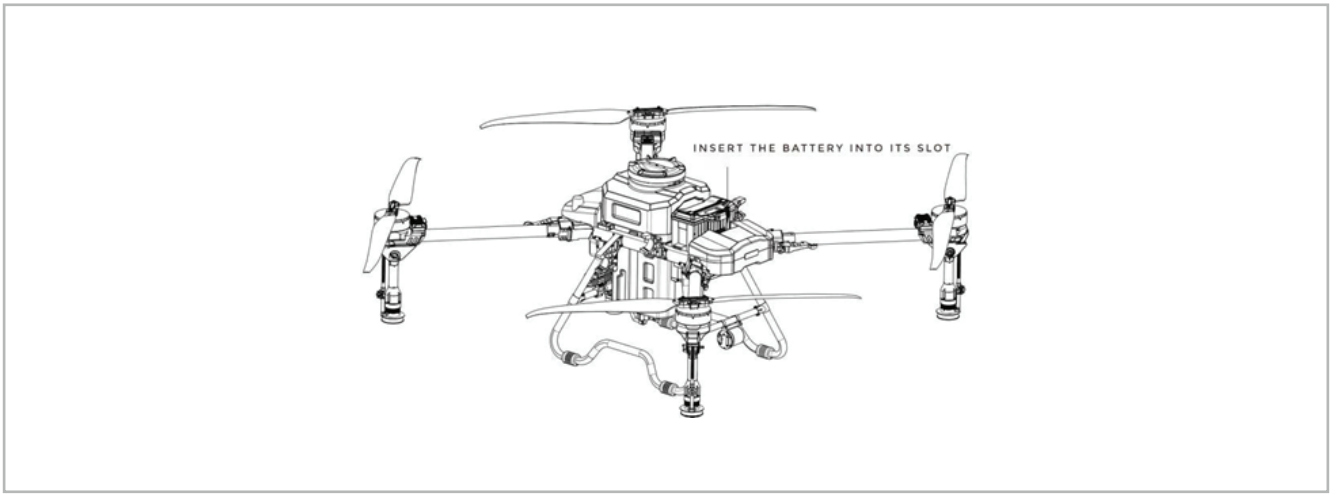
Unfold the centrifugal nozzle until it is perpendicular to the ground.

Figure shows the correct unfolding method.



3.1.1.5 Installing the Battery

Insert the battery into its slot until you hear a “click,” indicating that the battery latch is securely locked in place.

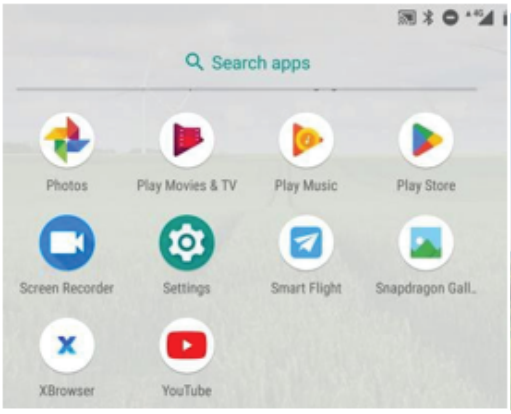


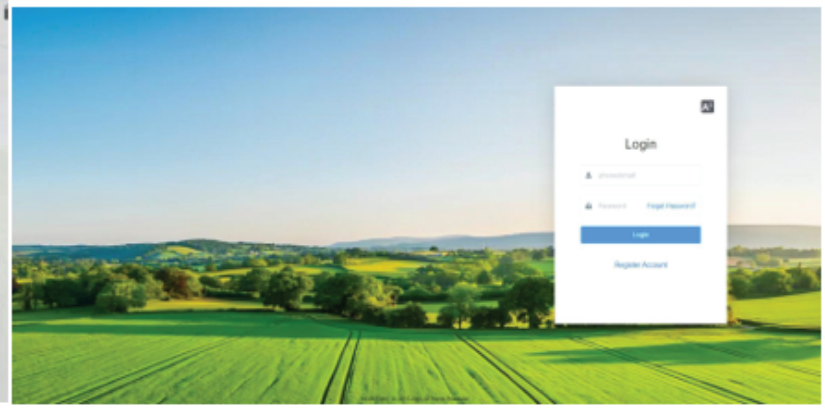
3.1.2 Ready for Takeoff

Power on the remote controller by long-pressing and then short-pressing the power button.

Locate and open the "Smart Flight" app interface on your device.

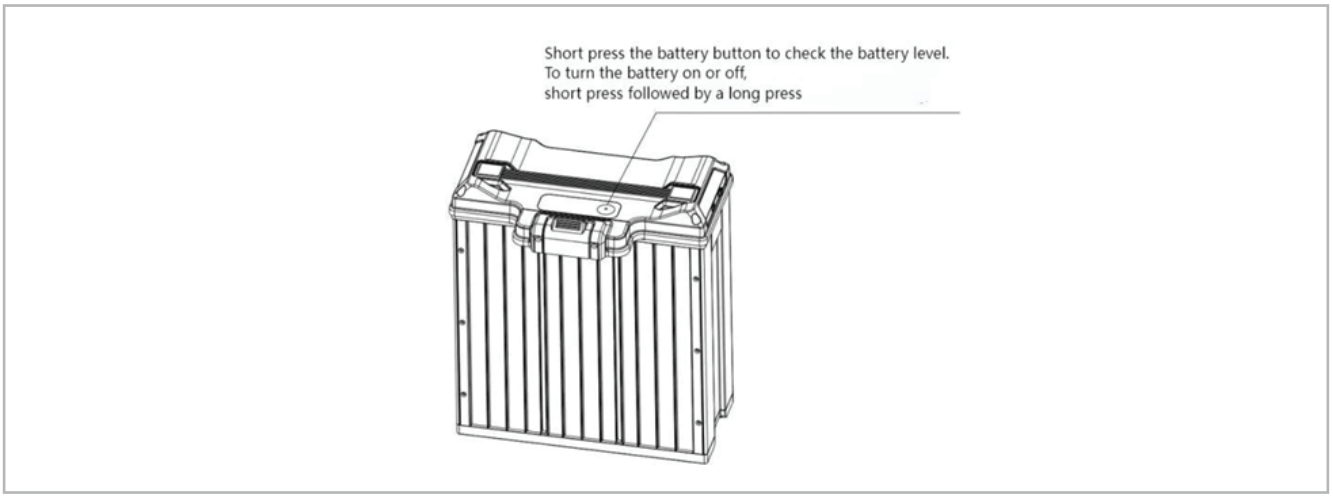
3.1.3 Power on the battery:





Short press the battery button to check the battery level. To turn the battery on or off, short press followed by a long press. Always ensure the battery is off before inserting or removing it to avoid damaging the drone or battery connections.

3.1.4 Connecting to the Drone



The connection status between the remote controller and the drone is displayed. Click the button to connect or disconnect the drone.

3.2 OPERATION

- Do not approach the rotating propellers and motors while the drone is in operation.
- Be cautious of potential pinching hazards when folding the arms of the drone.
- Ensure the drone's takeoff weight is below 108kg to avoid accidents.
- The operator must be professionally trained and certified. Untrained personnel should not operate the drone.
- When performing maintenance, replacing parts, adjusting equipment, testing, or upgrading the firmware, make sure the propellers are removed.
- Do not operate the drone under the influence of alcohol, fatigue, or illness.
- If the operating environment does not meet the radar module's working conditions, the drone will not automatically avoid obstacles during return-to-home (RTH) procedures. If the remote control signal is normal, you can manually control the flight speed and altitude.
- Always turn on the remote controller before connecting the power supply. After use, disconnect the power supply before turning off the remote controller.
- Pay close attention to the drone's status and the app status during flight. If any unexpected situation occurs, manually intervene to ensure safety.
- In specific flight modes or environments, the obstacle avoidance and terrain-following functions may not be available. Always monitor the drone's status and assess the flight conditions to avoid obstacles in time.

3.3 PRE-OPERATION CHECKS

- Ensure the remote controller battery and the power battery are fully charged (check the base station battery when using RTK).
- Ensure all components are intact. If any parts are worn or damaged, replace them before flying.
- Ensure the landing gear and spraying system are securely installed, and all screws are tightened.
- Ensure the propellers are undamaged and securely installed, and that the arms and propellers are fully extended and the arm nuts are tightened.
- Ensure the drone's motors are clean and undamaged.
- Ensure the spraying system is not clogged and is functioning properly.
- Check the app for any abnormal warnings before flying.
- Check NOTAMS (especially for GPS interference testing)
- Check for GPS lock, battery strength.
- Check site clearance.
- Props do not have any chips or cracks,
- arms locked, spray lines are attached, sensors attached and not obstructed.

3.4 BASIC FLIGHT

3.4.1 Automatic Landing

During landing, throttle control is disabled, but directional control (forward, backward, left, right) remains functional. Once the drone lands, the motors will automatically stop.

3.4.2 Status Indicator Light in No-Fly Zones

When the drone is in a no-fly zone, the status indicator light will flash red.

3.4.3 Avoiding Sensitive Areas

Unless otherwise approved by aviation authorities, avoid flying near airports, highways, railway stations, subway stations, city centers, etc. Unless otherwise approved by aviation authorities, fly within visual line-of-sight whenever possible.

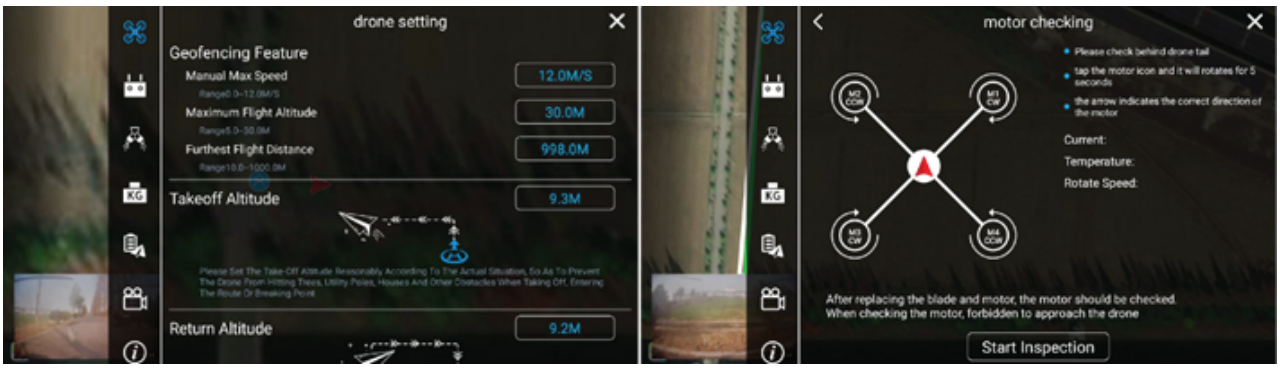
3.5 DRONE POWER SUPPLY

• Turn on the battery by short-pressing and long-pressing the power button. Wait for the battery indicators to light up in sequence before releasing the button. Once the drone connects and completes satellite search, and the remote controller reports a good signal and the RTK turns green, the drone is ready for takeoff.

• If the remote controller has no network connection, the RTK will be unable to obtain positioning information.

3.6 MOTOR INSPECTION

• Enter the app's operation interface and click the "More Settings" button in the top-right corner. Go to the drone settings, and enter the motor inspection menu. Follow the app's prompts to check each motor, ensuring they are rotating in the correct direction.



3.6.1 Motor Inspection Notes:

• The purpose of the motor check is to ensure the correct rotation of motors and correct installation of propellers. Improper installation can cause the drone to crash, resulting in injury or damage.

• Propellers are marked for identification: "CCW" (counterclockwise) and "CW" (clockwise).

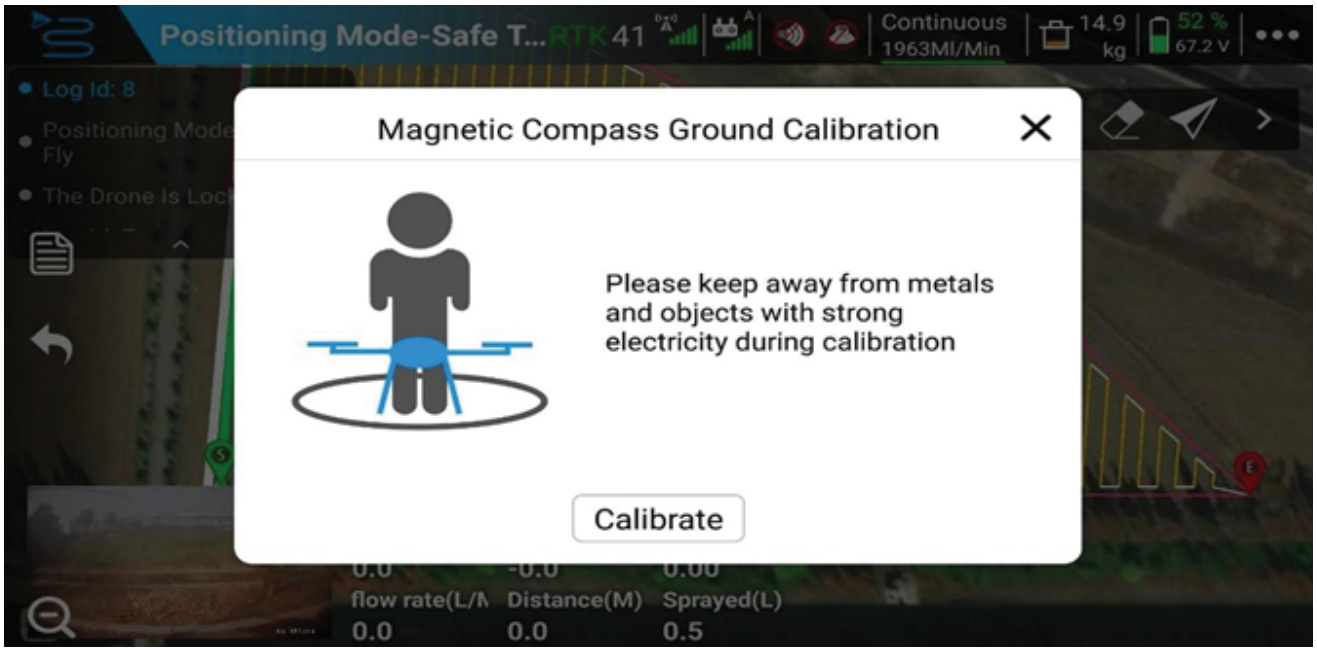
• During motor checks, stay behind the drone and keep a safe distance. Avoid approaching rotating motors or propellers.

3.6.1.1 Situations requiring motor inspection:

- After assembling the drone, or plugging/unplugging motor power or signal lines.
- After replacing the propellers, motors, arms, or any components affecting motor rotation.

3.6.2 Compass Calibration

Enter the app's operation interface and click on the "More Settings" button in the top-right corner. Go to the drone settings and enter the sensor interface. Click on "Compass Calibration" and follow the prompts in the app to calibrate the compass.



3.6.2.1 Compass Calibration Notes:

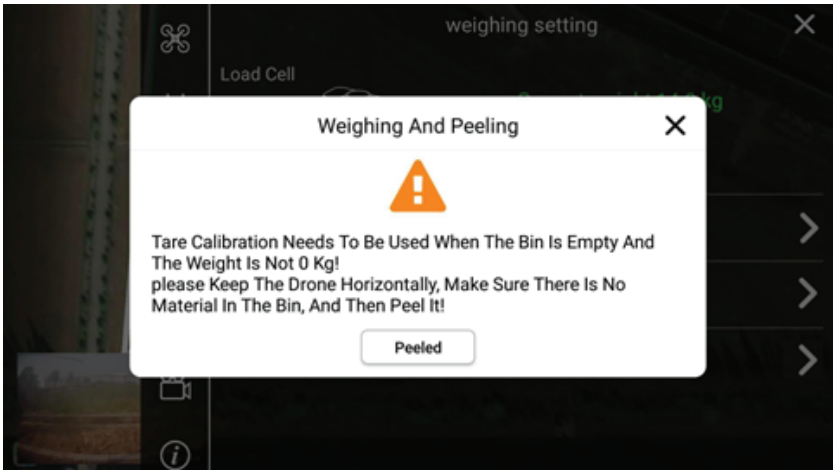
o Compass calibration is required in the following cases to ensure accurate flight direction. Otherwise, it may lead to flight safety issues:

1. After assembling the drone.
2. After replacing the GPS module.
3. If the distance between the current flight location and the previous flight location is more than 100 kilometers.
4. When the app prompts "Compass Abnormal" or when there are deviations in flight direction.

3.6.3 Tare Weight Adjustment

Tap the "Tare Weight" icon and place the drone on a level surface. Empty the operation box and reset the weight system to zero.

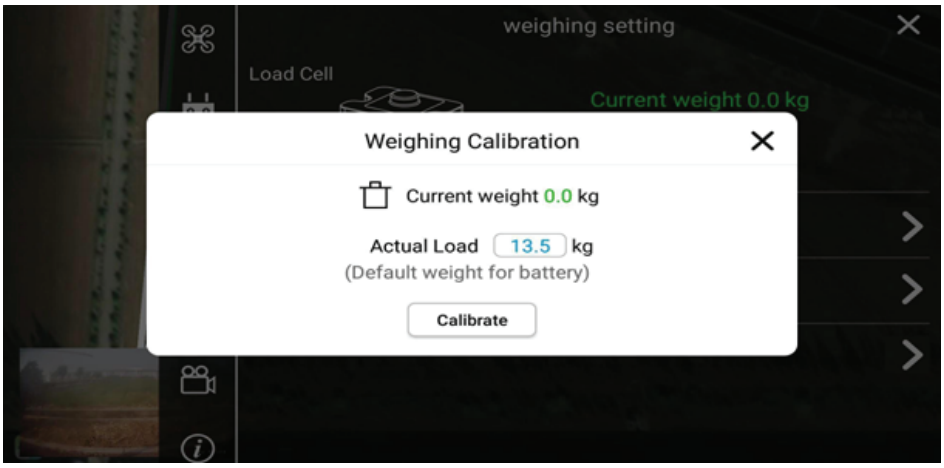
Note: Tare weight adjustment is generally performed before the operation. If the displayed weight is still incorrect after adjustment, calibration is necessary.



3.6.4 Weight Calibration

Place the drone's battery in the pesticide tank, and after clicking "Done," check whether the current weight is 13.5kg (which is the battery's weight). Alternatively, add a certain amount of material to the tank, manually input the material's weight, and click "Calibrate."

Note: Tare weight adjustment must be performed before calibration. If the weight is still inaccurate after calibration, perform sensor calibration.



3.6.5 Spraying Calibration

Add 35 liters of clean water to the pesticide tank and click to start the spraying calibration. The system will record the maximum flow rate of the pump. If the app reports a low flow rate, check if the filter is clogged.

3.7 PRE-FLIGHT STATUS CHECK

3.7.1 Safe Distance

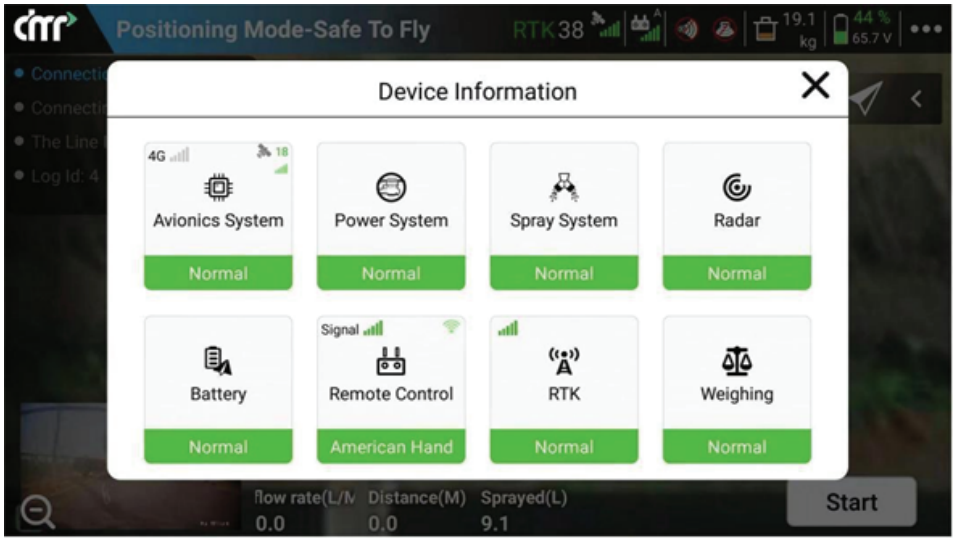
The operator should stand facing the tail of the drone, maintaining a safety distance of at least 10 meters away from the drone.

3.7.2 Check Remote Control Mode

1. Enter the app's operation interface and check the control mode in the parameter information bar. Ensure that the remote-control mode is correctly set (abbreviations: US—American mode, CN—Chinese mode, JP—Japanese mode). If the mode needs to be changed, go to "More Settings" -> "Remote Control Settings" -> "Change Control Mode."
2. The default factory setting is American mode, and all instructions and diagrams in this manual use American mode as an example.

3.7.3 Check System Status

Confirm that all parameters in the app's operation interface are normal before unlocking the drone. Check the status bar for any abnormal warnings and ensure the equipment status bar is green before proceeding with a safe takeoff.



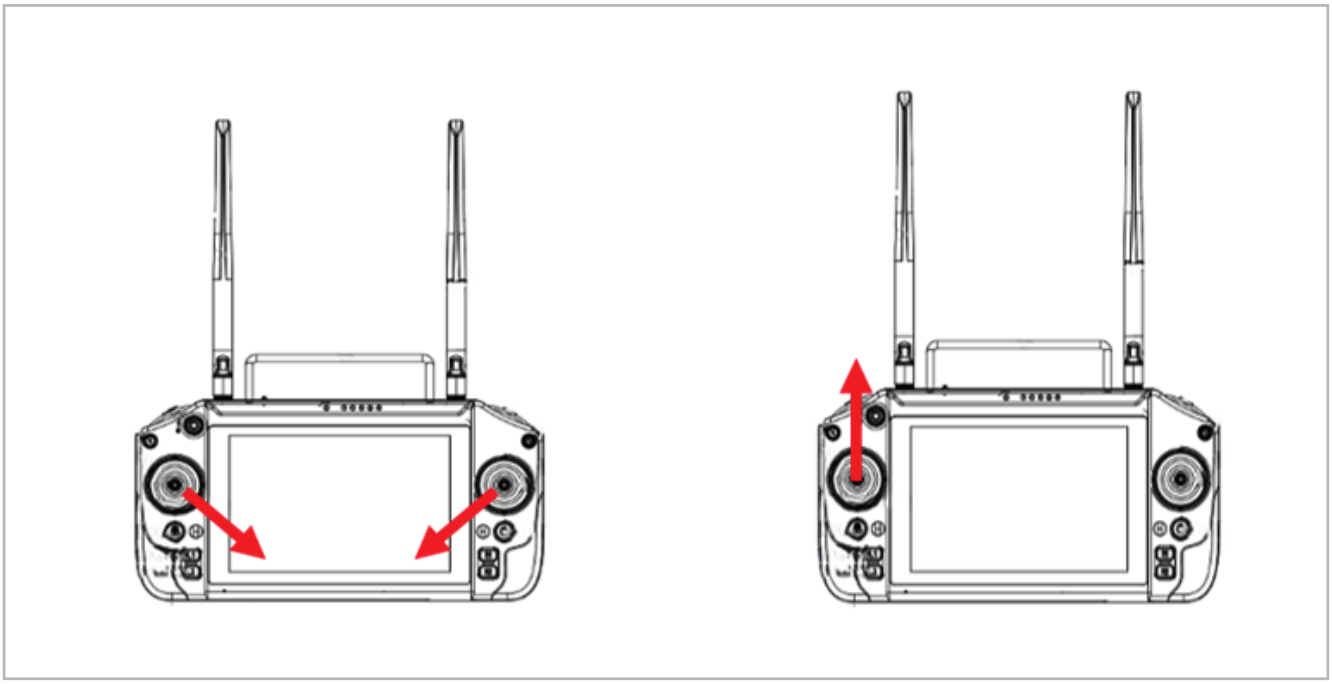
3.8 STARTING AND STOPPING THE DRONE

3.8.1 Starting the Motor and Taking Off

Step 1. Pull the left joystick and right joystick diagonally as the directions shown. . The drone will emit a warning sound, the motor indicator lights will blink, and the propellers will start spinning at idle speed after 3 seconds.

Step 2. Push the throttle stick up, and the drone will take off.

Step 3. During takeoff, all crew members should not turn their backs on the drone and also be near a solid object which can stop the drone.



3.8.2 Operating the Drone

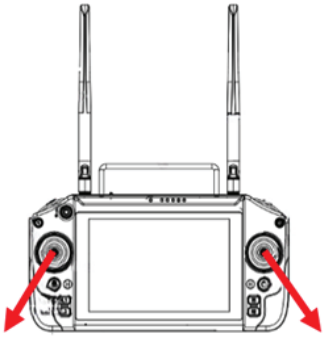
Operate the drone forward, backward, left, right, turn left, turn right, ascend, and descend by manipulating the joystick according to the corresponding control mode. Refer to the diagram of APP operation modes for specific operating methods.

3.8.3 Landing and Stopping Propellers

Step 1. During landing, all crew members should not turn their backs on the drone and be near a solid object which can stop the drone.

Step 2. Pull down the throttle stick until the drone lands on the ground. Land the drone manually by gently lowering the throttle stick until the drone touches down on a flat, stable surface.

Step 3. You have two ways of stopping the propellers:



Option 1. After landing on the ground, pull diagonally the left joystick and right joystick in the directions shown to stop the propellers.

Option 2. After landing on the ground, pull the throttle stick down to the lowest position for 3 seconds to stop the propellers

Step 4. After the motors stop, first disconnect the drone's power supply, then turn off the remote controller.

⚠ High-speed rotating propellers are dangerous, so users should maintain a safe distance from the drone, and the drone should stay away from crowds, animals, or other obstacles.

⚠ When the drone is flying in the air, do not pull left and right joysticks in the direction of outward diagonal; otherwise, the drone will stop the propellers in the air.

⚠ In case of a malfunction or operational error causing the drone to fly towards crowds, vehicles, animals, buildings, etc., pull the left and right joysticks in the direction of outward diagonal promptly to stop the drone and minimize accidents and losses.

3.9 PREPARATION FOR OPERATION

- **Adding Pesticides:** Pour the pesticide solution into the tank.
- **Air Purging:** Press the "Spray" button on the remote controller or enter the app's "More Settings"

-> "Spray Settings" -> "Pipeline Air Purging" interface -> Start spraying to purge the air from the system.

3.10 MANUAL ENHANCED OPERATION MODE

- Enter the app's operation interface -> Click "Start Operation" -> Select "Manual Enhanced Operation (M+)" -> Set operation parameters -> Unlock and takeoff -> Tap "Start M+ Operation" in the app -> Fly the drone to perform the spraying task -> Tap "End M+ Operation" -> Review the operation report -> Confirm by tapping "OK" to end the operation.

3.11 AB POINT OPERATION

- Enter the app's operation interface -> Click "Start Operation" -> Select "AB Operation" -> Set operation parameters -> Unlock and takeoff -> Fly the drone to a suitable position at one end of the field -> Tap the "A" button in the app to mark point A -> The drone will begin spraying according to the set parameters -> Fly the drone to the other end of the field -> Tap the "B" button in the app to mark point B -> Choose the direction for the drone to follow -> Conduct a pre- operation check -> Start AB Point Autonomous Operation -> Tap "End AB Operation" -> Review the operation report -> Confirm by tapping "OK" to end the operation.

3.12 ROUTE OPERATION

- Field Mapping:

Enter the app's "Task Planning" interface -> Tap "Add Field" -> Select a method to create the field -> Add boundary points, obstacle points, and reference points -> Save the field.

3.13 TASK EXECUTION:

Enter the app's "Task Execution" interface -> Tap "Start Operation" -> Select "Route Operation" -> Choose the pre-planned field -> Edit field parameters -> Tap "Execute Task" -> Set operation parameters -> Upload the route -> Perform pre-operation checks -> Start autonomous route operation -> After completing the route, review the operation report -> Confirm by tapping "OK" to end the operation.

Note: During operation, you can control the throttle to maintain the current altitude. When the throttle is in the neutral position, the drone will hold its altitude.

3.14 SAFE STORAGE PROCEDURES

Land the drone manually by gently lowering the throttle stick until the drone touches down on a flat, stable surface.

3.15 STARTING OPERATION

3.15.1 Preparation for Operation

Adding Pesticides: Pour the pesticide solution into the tank.

Air Purging: Press the "Spray" button on the remote controller or enter the app's "More Settings" -> "Spray Settings" -> "Pipeline Air Purging" interface -> Start spraying to purge the air from the system.

3.16 MANUAL ENHANCED OPERATION MODE

Enter the app's operation interface -> Click "Start Operation" -> Select "Manual Enhanced Operation (M+)" -> Set operation parameters -> Unlock and takeoff -> Tap "Start M+ Operation" in the app -> Fly the drone to perform the spraying task -> Tap "End M+ Operation" -> Review the operation report -> Confirm by tapping "OK" to end the operation.

3.17 AB POINT OPERATION

Enter the app's operation interface -> Click "Start Operation" -> Select "AB Operation" -> Set operation parameters -> Unlock and takeoff -> Fly the drone to a suitable position at one end of the field -> Tap the "A" button in the app to mark point A -> The drone will begin spraying according to the set parameters -> Fly the drone to the other end of the field -> Tap the "B" button in the app to mark point B -> Choose the direction for the drone to follow -> Conduct a pre- operation check -> Start AB Point Autonomous Operation -> Tap "End AB Operation" -> Review the operation report -> Confirm by tapping "OK" to end the operation.

3.18 FIELD MAPPING:

Enter the app's "Task Planning" interface -> Tap "Add Field" -> Select a method to create the field -> Add boundary points, obstacle points, and reference points -> Save the field.

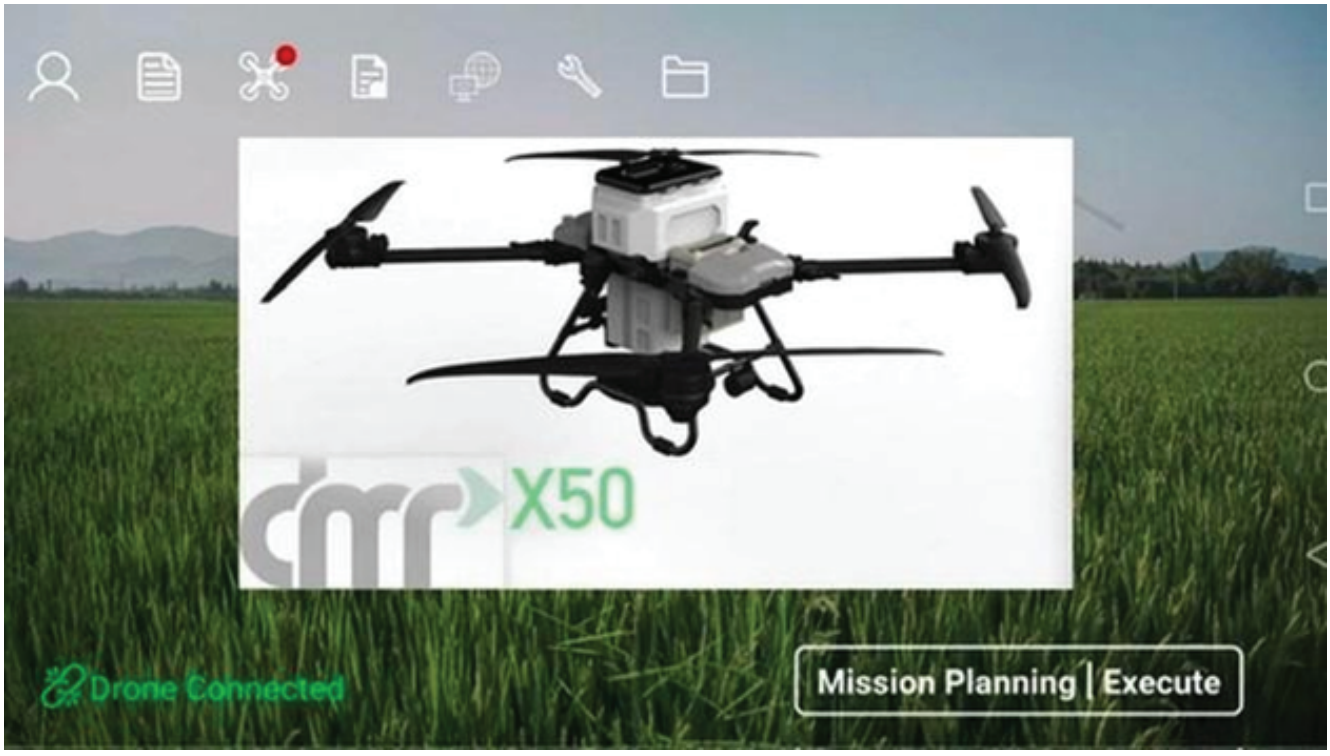
3.19 TASK EXECUTION:

Enter the app's "Task Execution" interface -> Tap "Start Operation" -> Select "Route Operation" -> Choose the pre-planned field -> Edit field parameters -> Tap "Execute Task" -> Set operation parameters -> Upload the route -> Perform pre-operation checks -> Start autonomous route operation -> After completing the route, review the operation report -> Confirm by tapping "OK" to end the operation.

Note: During operation, you can control the throttle to maintain the current altitude. When the throttle is in the neutral position, the drone will hold its altitude.

3.20 APP GROUND STATION INSTRUCTIONS

3.20.1 Main Interface

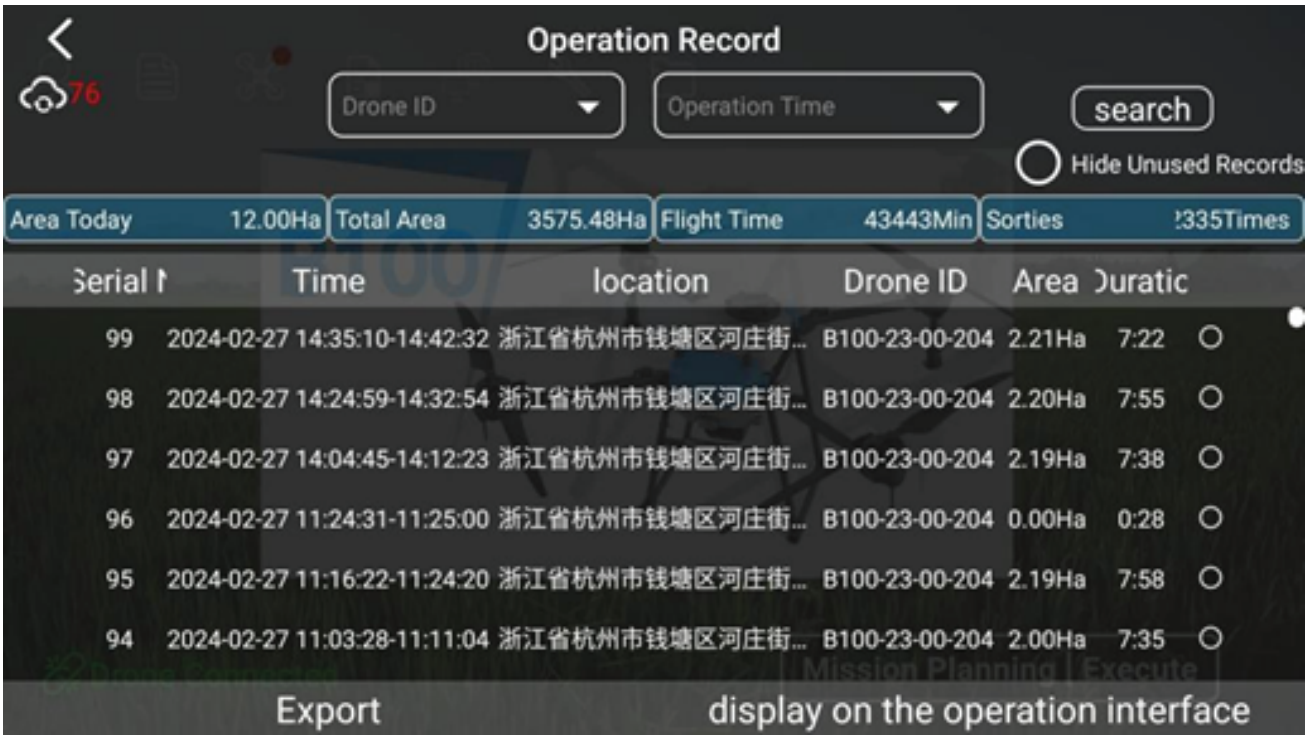


3.20.2 User Information:

Allows you to log out, complete real-name certification, operator certification, add drones, and more. Drones must be added before they can be controlled.

3.20.3 Operation Records:

Allows playback of operation records, filtering and statistical analysis of records, and synchronization of local records with the cloud backend.



3.20.3.1 Sync Operation Records:

Sync your operation records to the cloud. The exported files are stored in the following path: agr->record->export.

3.20.4 Device Information:

View the version information of connected drones. You can perform upgrades and downgrades.

3.20.5 Log Upload:

Upload flight logs by connecting the remote controller.

3.20.6 Ntrip RTK:

Configure the RTK's IP address, mount point, and account information. The Ntrip RTK function must be enabled.

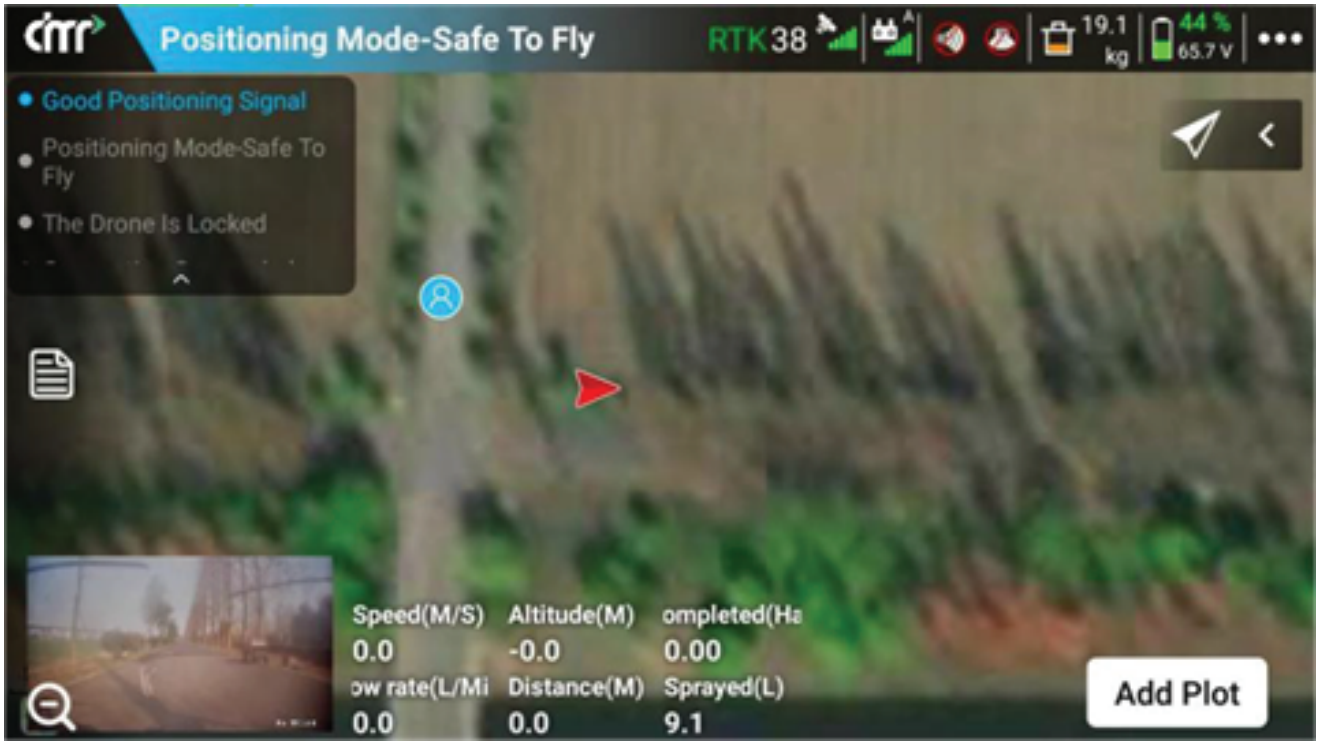
3.20.7 KMZ/KML File Import:

Import pre-mapped KMZ/KML files into the remote controller.

3.20.8 Task Planning

3.20.8.1 View, Edit, or Call Existing Fields:

Access previously created fields, or use the drone or RTK marker to create new ones.



3.20.8.2 Field List:

Manage fields by sharing, deleting, editing, or synchronizing them.

Adding a Field: Tap "Add Field" and select a method to add boundary points to the field.

3.20.8.3 Map Pointing:

Suitable for open fields without obstacles. **THE ACCURACY IS RELATIVELY LOW, SO USE WITH CAUTION!**

3.20.8.4 Place boundary points:

Drag the map to align the marker with the edge of the field boundary, then tap to mark the boundary point.

3.20.8.5 Boundary Types:

Switch between boundary points, inserted points, square obstacle zones, circular obstacle zones, no-spray zones, and reference points.

3.20.8.6 Square Obstacle Zones:

Mark the edges of square-shaped obstacles in the field.

3.20.8.7 Circular Obstacle Zones:

Create a circular obstacle zone by tapping the center and adjusting its radius.

3.20.8.8 No-Spray Zones:

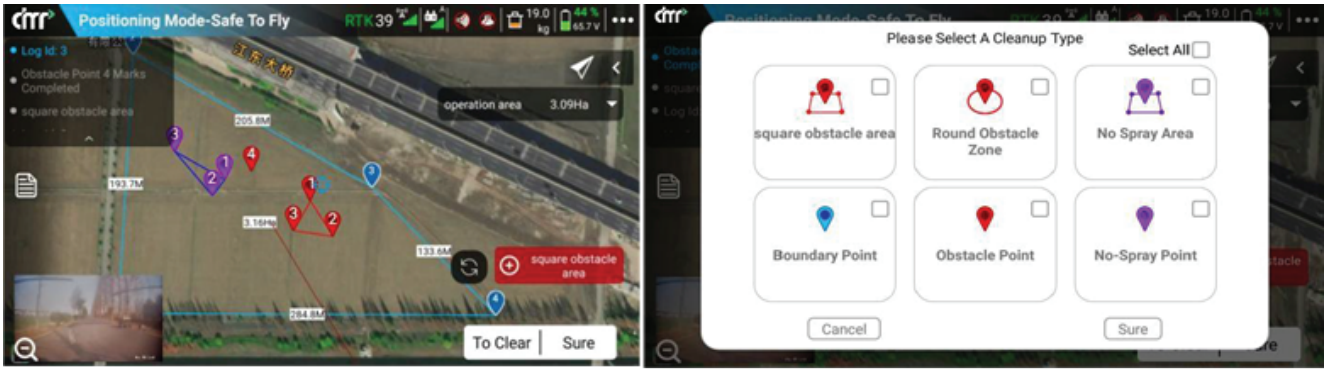
Mark areas where spraying is not needed to optimize the flight path.

3.20.8.9 Reference Points:

Place a reference point at a prominent location near the field to correct potential map offset errors.

3.20.8.10 Clearing Points:

Remove unwanted boundary points or zones by tapping to select and clear them.



3.20.8.11 Drone-Based Pointing:

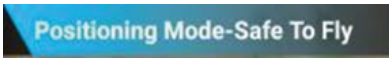
Use the drone to fly along the edge of the field and mark boundary points while flying.

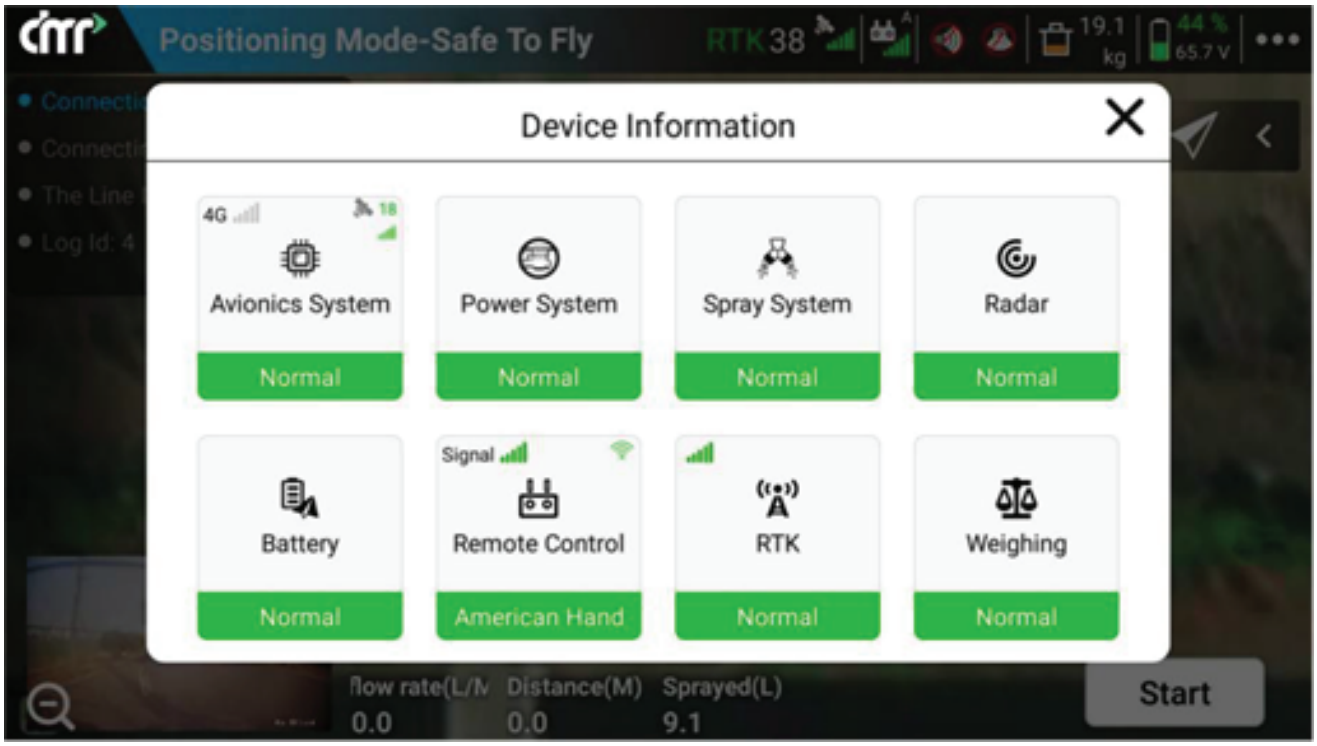
3.20.8.12 RTK Marker-Based Pointing:

Walk along the field boundary with the RTK marker to mark boundary points.

3.20.8.13 Task Execution

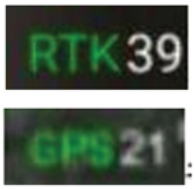
Drone Information:

Tap the status bar to view detailed information about the drone. Tap any device icons to get more details about the corresponding device. 



3.20.10 RTK Status:

The RTK status indicates the current number of satellites and the RTK connection status using different colors:



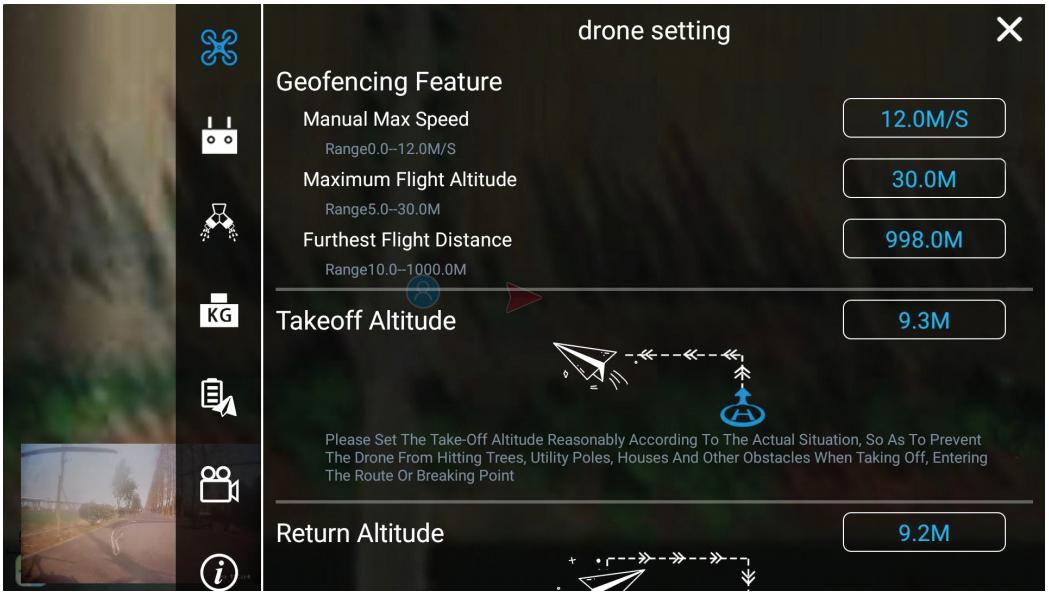
- Green: RTK is fully connected, with accurate differential data.
- Orange: The RTK is in floating-point mode, calculating differential data.
- Red: RTK signal is poor or unreliable.

3.20.11 GPS Positioning:

If RTK is turned off, the drone will use GPS for positioning. The color-coded status of the GPS is:

- Grey: No GPS signal.
- Red: Less than five satellites.
- Orange: 5–16 satellites.
- Green: More than 16 satellites.

3.20.8.3 More Settings:



Access advanced settings through the "More Settings" menu.

3.20.8.3 Map Tools:

Toggle between various map tools to adjust your view and interaction with the map.

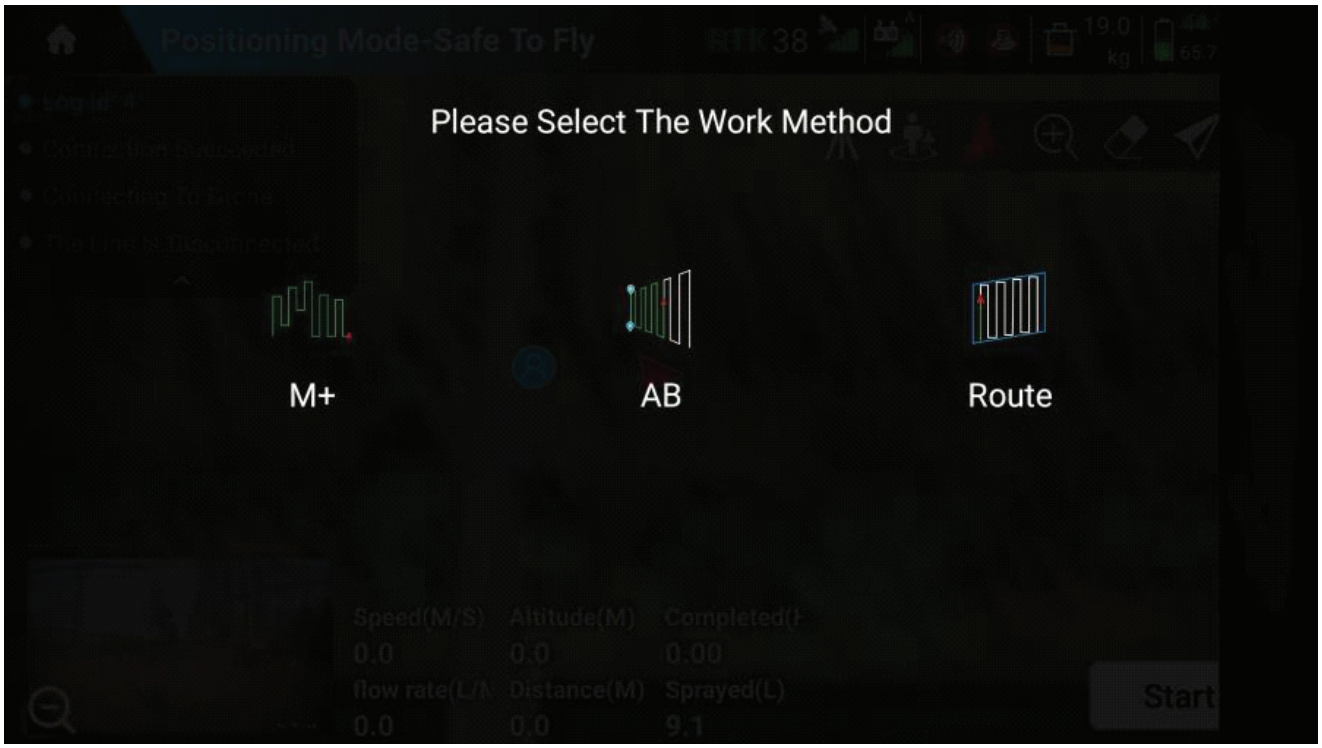
3.20.8.3 Operational Parameters:

View and adjust flight parameters such as speed, altitude, and pesticide flow rate. Monitor sprayed area and consumed pesticide.

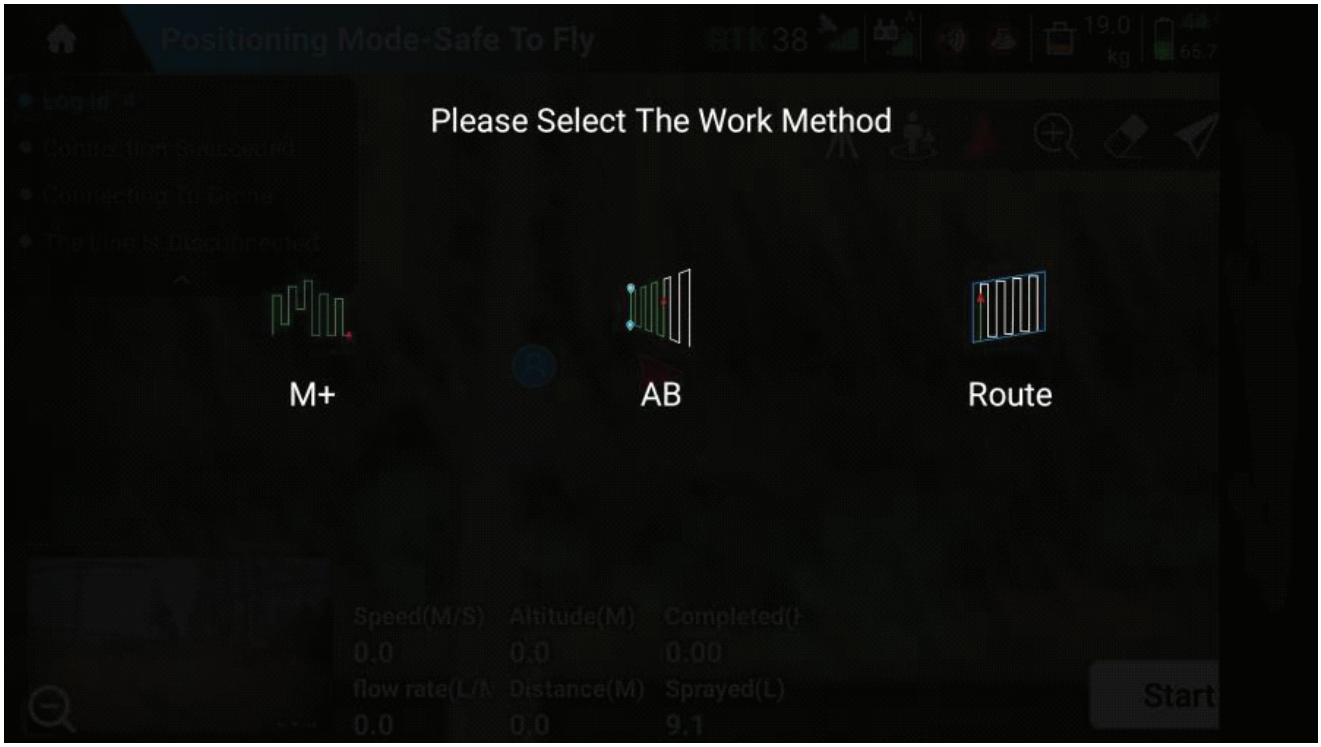
3.20.8.3 Operation Modes:

3.20.8.1 M+ Mode (Enhanced Manual Operation):

This mode is suitable for small irregular fields or temporary tasks where no pre-planning is needed. In this mode, the drone can lock its heading direction to prevent unintended deviations from the flight path. It also allows lateral movement to the left or right, which needs to be set in advance.



3.20.8.3 Parameter Settings:



Pesticide Use per Acre: Set the amount of pesticide needed per acre.

Lateral Movement Distance: Set the distance for the drone to move sideways. Recommended setting: 6–8 meters.

Flight Speed: Faster flight speeds increase efficiency.

Centrifugal Nozzle Speed: Adjust the nozzle rotation speed. Higher speeds create finer spray particles.

3.20.10 Spraying Mode:

- Precision: The flow rate is automatically calculated based on the lateral distance and speed to ensure accurate application.
- Speed-Based: The flow rate is adjusted based on the drone's speed.
- Continuous Spraying: Spraying is constantly on.

3.20.10 Water Pump Mode:

- Dual-Pump Mode: Best for small acreages requiring a lower application rate
- Quad-Pump Mode: Suitable for high-efficiency operations with a four-nozzle configuration.
- Smart Mode: Automatically selects the optimal pump mode based on the set pesticide usage per acre.

Start spraying by tapping the "Start" button in the app or using the spraying switch on the remote controller.

When the pesticide tank is empty or the battery is low, the operation will pause. Refill the tank or change the battery, then tap "Continue" in the app to resume the operation.

Operation Parameters Adjustment: During operation, you can modify the settings by opening the operation parameters pop- up window and adjusting them as needed.

3.20.8.3 Operational Parameters:

The radar can detect obstacles within 2-30 meters (there may be blind spots within two meters) and initiate obstacle avoidance measures. You can toggle the obstacle avoidance mode in the settings or use the "C" button on the remote controller to enable it.

When obstacles are detected within 15 meters, the drone will begin to decelerate. At 7 meters, obstacle avoidance will be triggered.

The radar can detect obstacles within 2-30 meters (there may be blind spots within two meters) and initiate obstacle avoidance measures. You can toggle the obstacle avoidance mode in the settings or use the "C" button on the remote controller to enable it.

When obstacles are detected within 15 meters, the drone will begin to decelerate. At 7 meters, obstacle avoidance will be triggered.

3.20.8.3 Terrain Following Radar

The radar maintains a consistent height between the drone and the crops, allowing the drone to follow the terrain's contour.

3.20.8.3 Radar Specifications:

Usable height range: 0.5–50 meters.

Recommended operational height: At least 1.5 meters.

Terrain slope: Less than or equal to 25°.

3.20.8.3 Important Notes:

Regularly clean the radar to prevent contamination from pesticides or debris, as this can affect performance.

Terrain-following radar has a slight delay in response, so the greater the terrain slope, the higher the drone should fly to avoid accidents.

3.20.8.3 Smart Battery Protection Mechanism:

3.20.8.1 Communication Protection:

When the battery fails to communicate with the drone, takeoff will be restricted. During flight, if communication is lost or delayed, the drone will pause in mid-air. Contact support for assistance.

3.20.8.1 Overcharge Protection:

If the battery's maximum cell voltage exceeds 4.35V, the drone will not be able to take off. Contact support for assistance.

3.20.8.1 Cell Voltage Difference:

Before takeoff, if the static cell voltage difference exceeds 300mV, the drone will be unable to take off. During flight, if the dynamic voltage difference exceeds 300mV for more than 3 seconds, the drone will pause and hover.

3.20.8.1 Low Battery Voltage:

The drone will not be able to take off if the battery voltage drops below 3.4V per cell or if the battery charge is less than 20%. The drone will automatically force-land when the battery charge drops below 5%.

3.20.8.1 Overheating Protection:

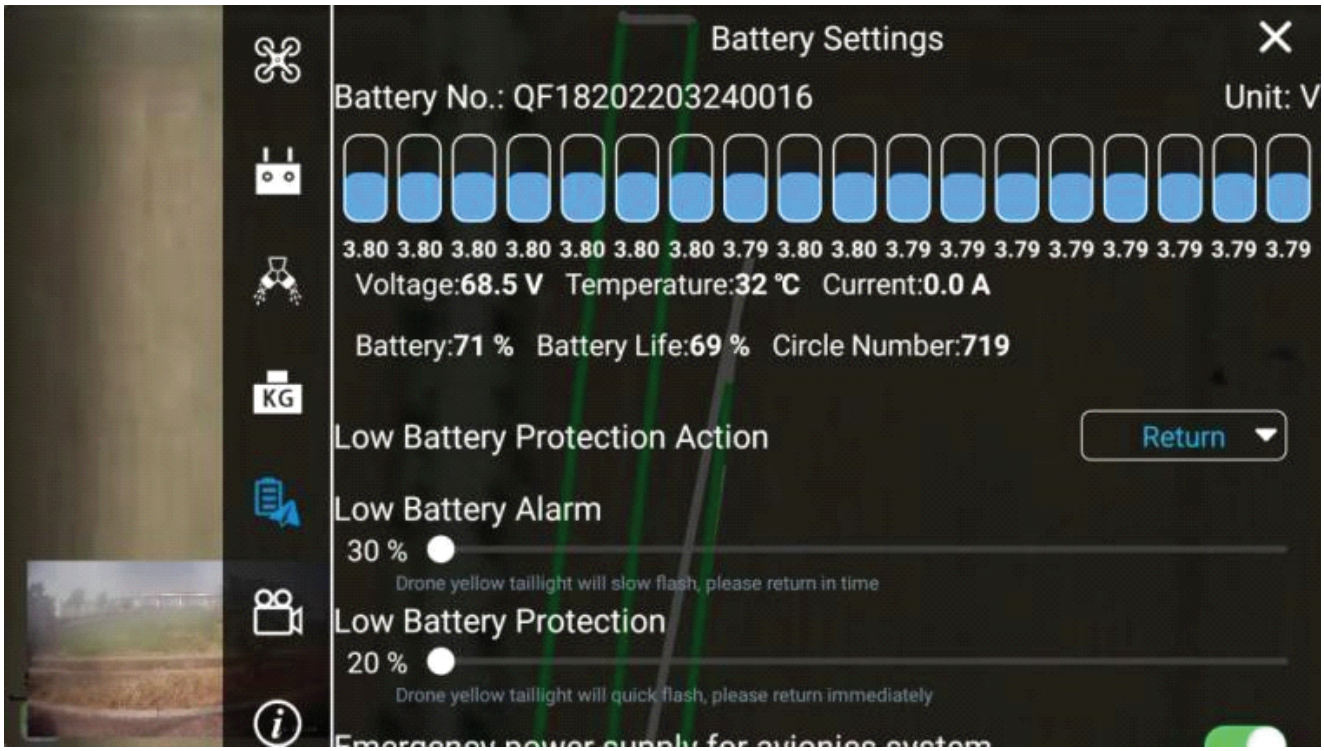
If the battery temperature exceeds 75°C before takeoff, the drone will not be able to take off. During flight, if the temperature exceeds 90°C, the drone will hover and pause the operation.

3.20.8.1 Low Temperature Protection:

Flights are prohibited if the battery temperature is below -5°C. Between -5°C and 10°C, flights are permitted only without a payload. Pre-warm the battery using a hover flight until the temperature exceeds 10°C before normal operations.

3.20.8.1 UPS Function:

When the UPS function is enabled, removing the battery will not immediately cut the power to the flight controller, allowing you to replace the battery without needing to reboot the system. If a new battery is not inserted within 20 seconds, the drone will shut down completely.

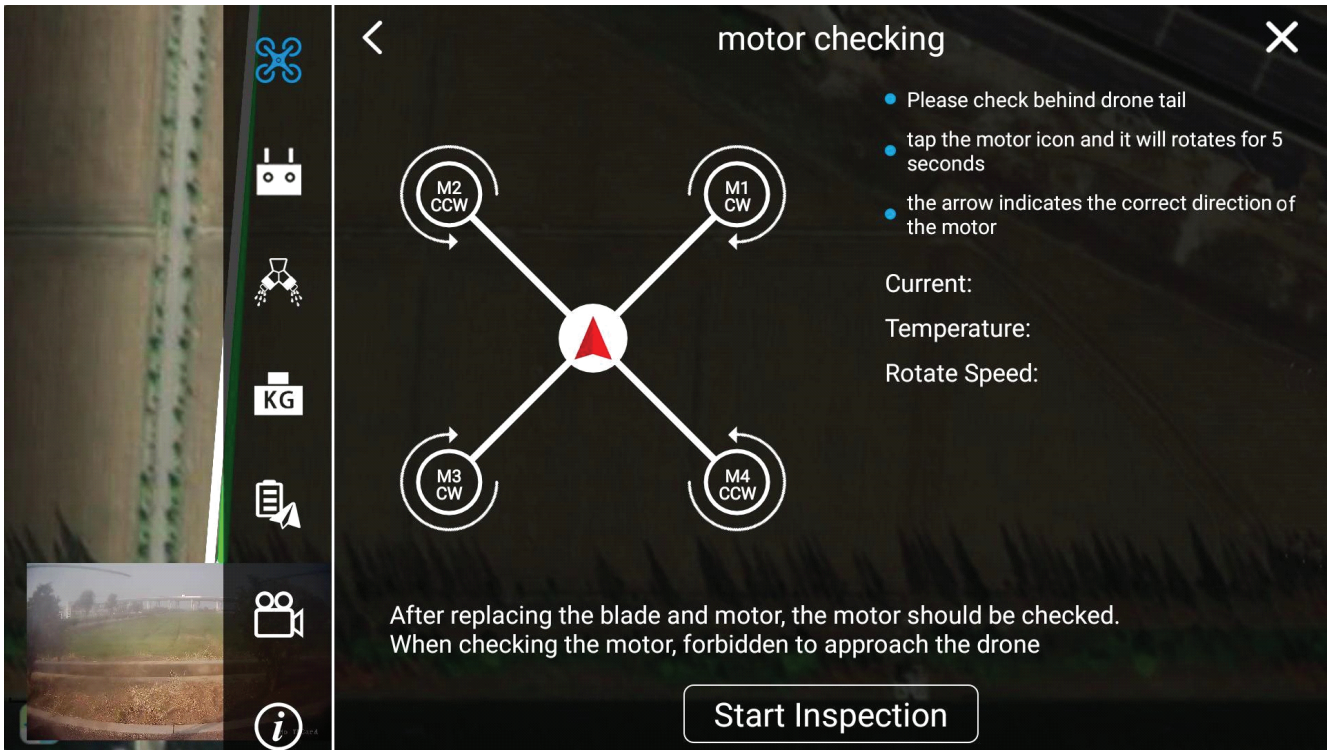


Note: When performing operations such as compass calibration that require a reboot, make sure the drone is fully powered off before restarting, otherwise, the reboot may fail.

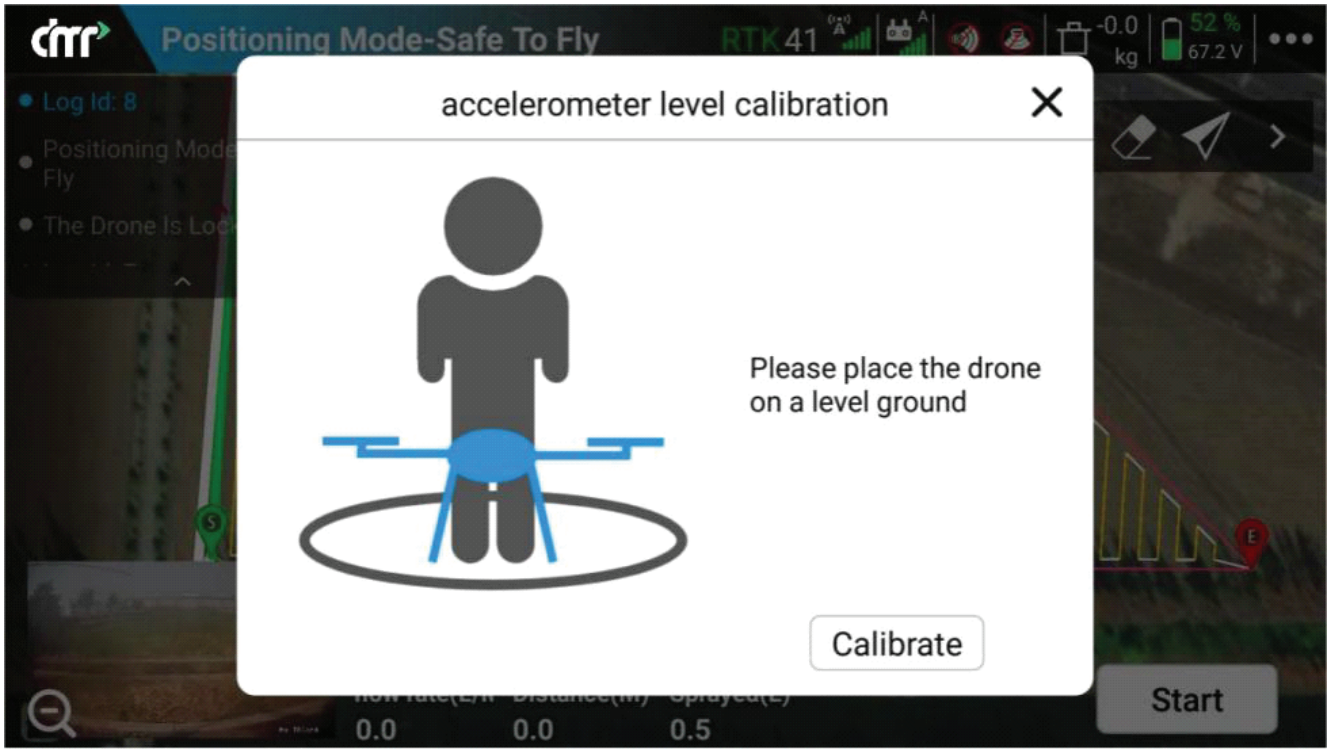
3.20.8.1 Motor Check Function:

Refer to the motor inspection procedure described earlier for details on how to use the motor check function.

3.20.8.3 Accelerometer Calibration:



To perform accelerometer calibration, enter the app's operation interface, click on the "More Settings" button in the top-right corner, go to the drone settings, and access the "Sensors" menu. Click on "Accelerometer Calibration" and follow the prompts to complete the calibration.



3.20.8.3 Situations requiring accelerometer calibration:

If the drone drifts while hovering, even with normal GPS positioning.

If the app displays "Accelerometer Error," perform the calibration before the next flight.

Note: The accelerometer is calibrated at the factory, so users don't need to recalibrate unless the drone exhibits abnormal behavior.

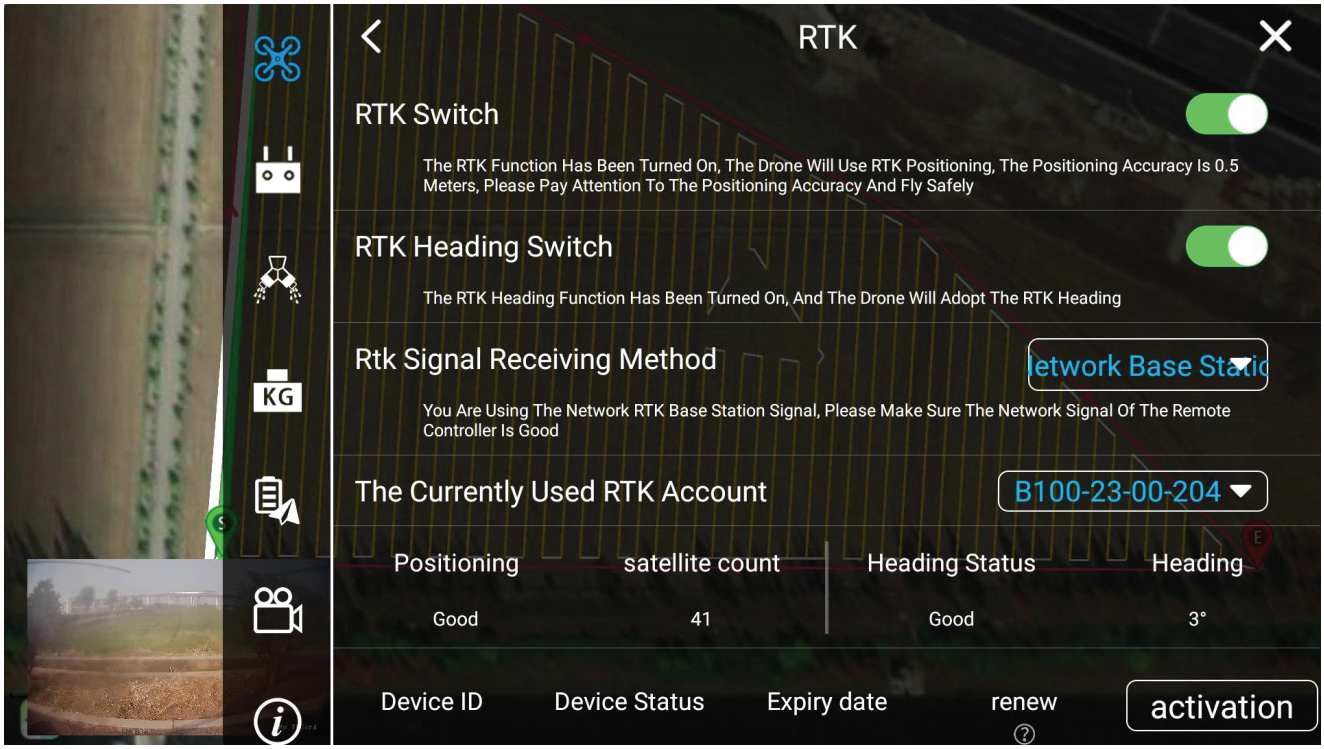
3.20.8.3 RTK Function

Network RTK: RTK (Real-Time Kinematic) allows for centimeter-level positioning accuracy, providing strong resistance to electromagnetic interference.

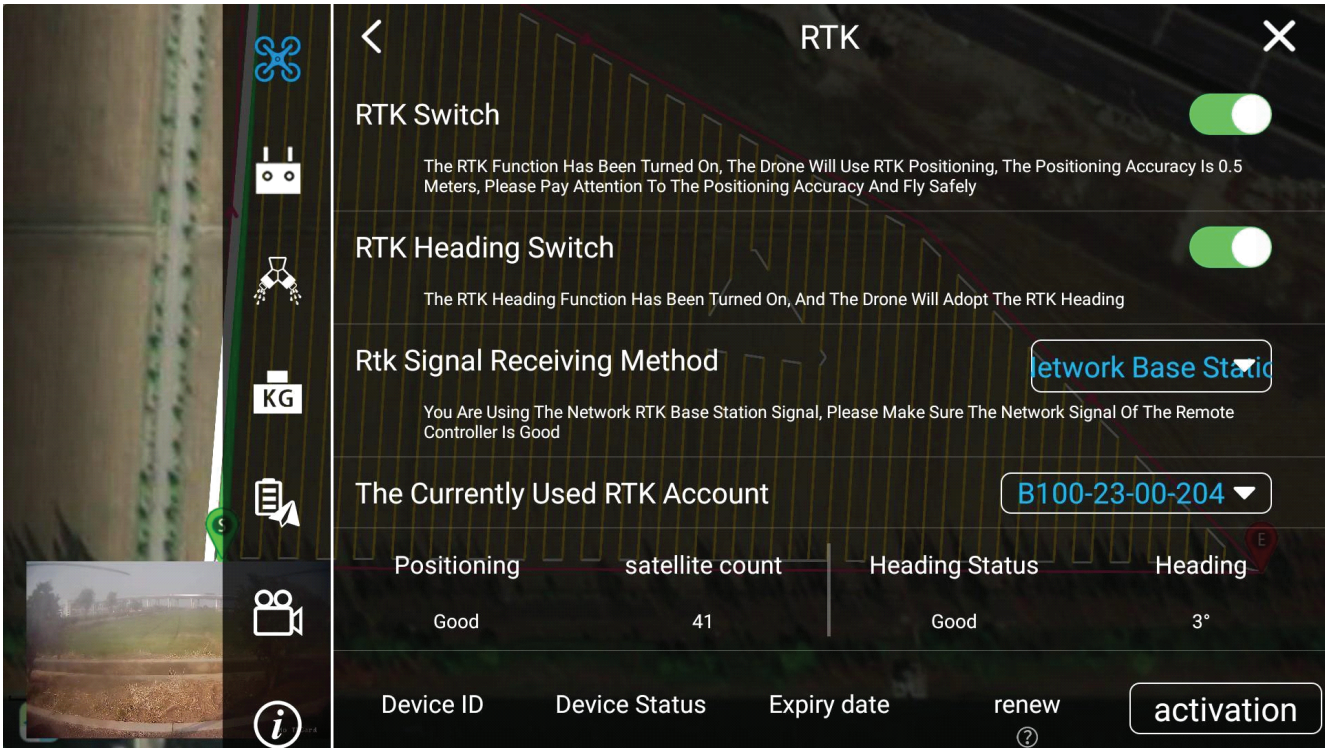
3.20.8.3 Steps to enable RTK:

Enter the app's operation interface and go to "More Settings." In the drone settings, toggle the "RTK" switch to enable RTK functionality and RTK heading.

Ensure the remote controller has an active internet connection.



In the RTK settings menu, select your RTK account and verify that it is still active. Expired accounts must be renewed.



3.30 RTK Signal Sources:

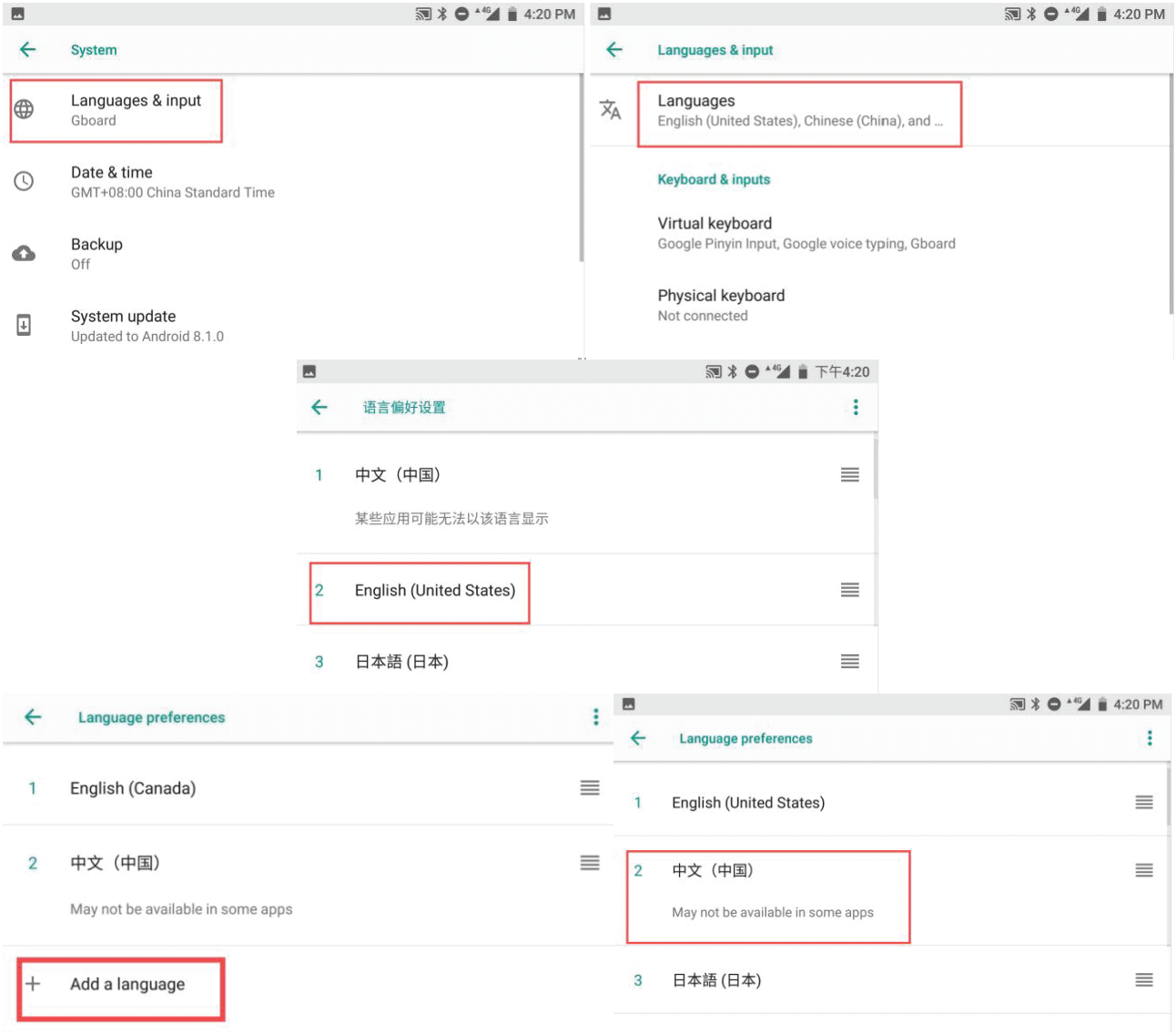
- Network Base Station: This option uses a network RTK base station for positioning, requiring a stable 4G signal on the remote controller.
- Ntrip RTK: Users can supply their own RTK account. After configuring the account information, return to the main interface and proceed with the task.
- Mobile Base Station: If using a mobile base station, follow the specific instructions provided with the base station equipment. Ensure the base station is set up in an open area with a recommended height of 3.5 meters or more for optimal signal reception.

3.30 Language Switching

To switch to another language, change the language settings on the remote controller, and the app will automatically follow the remote controller's system language. If the desired language is unavailable, the app will default to English

3.30 Steps to change the language:

Swipe up on the home screen to access all apps, then tap on "Settings." Tap "System" -> "Language & Input" -> "Language" -> "Add Language." Select the desired language and drag it to the top of the list.

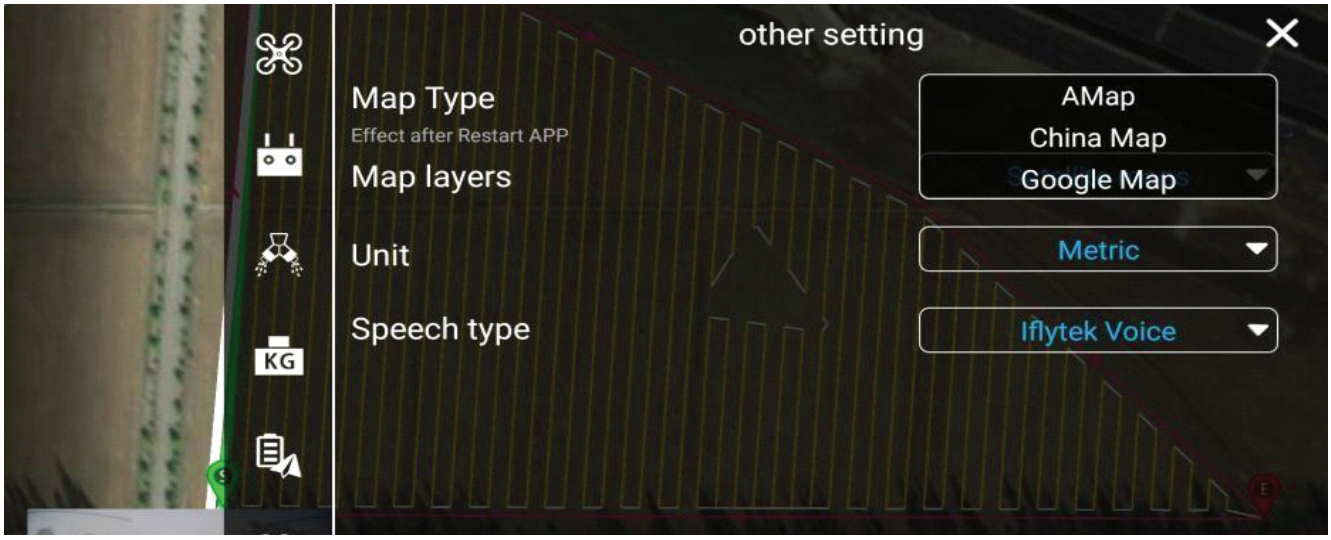


3.30 Map Switching

After switching the language, switch to the appropriate map to avoid misalignment between the positioning and map data.

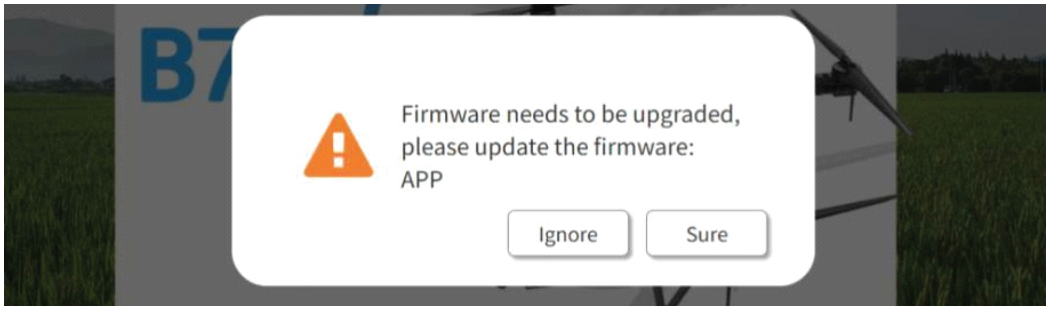
3.30 Steps to switch maps:

Swipe up on the home screen to access all apps, then tap on "Settings." Tap "System" -> "Language & Input" -> "Language" -> "Add Language." Select the desired language and drag it to the top of the list.

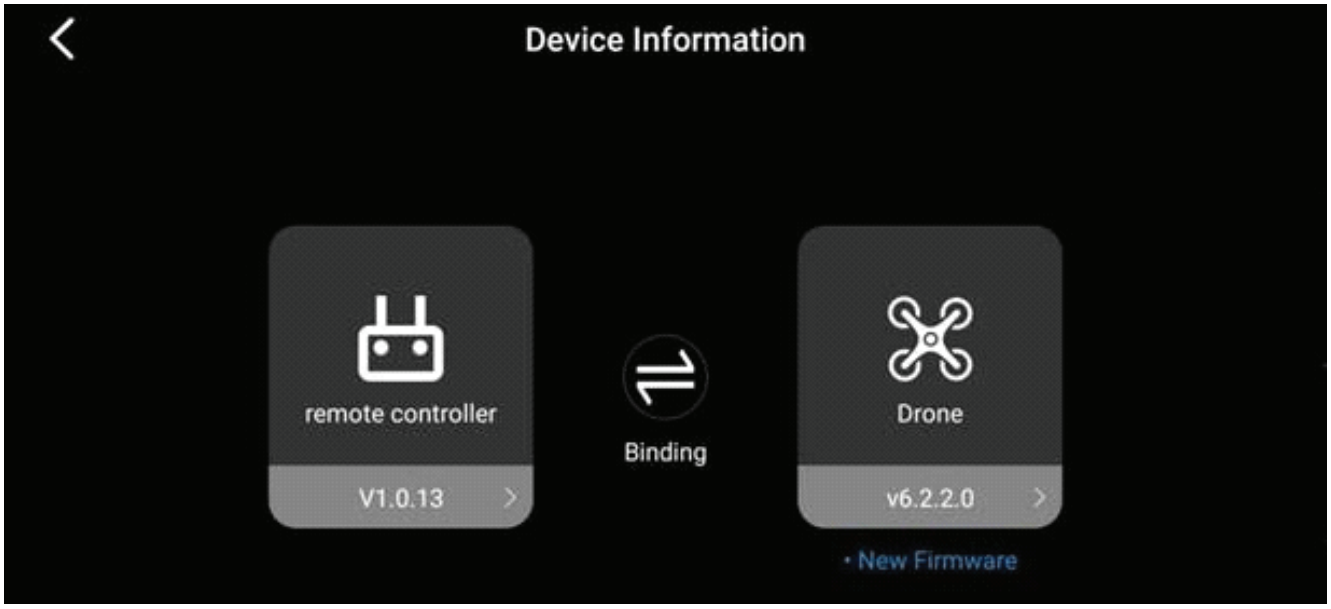


3.30 Upgrades

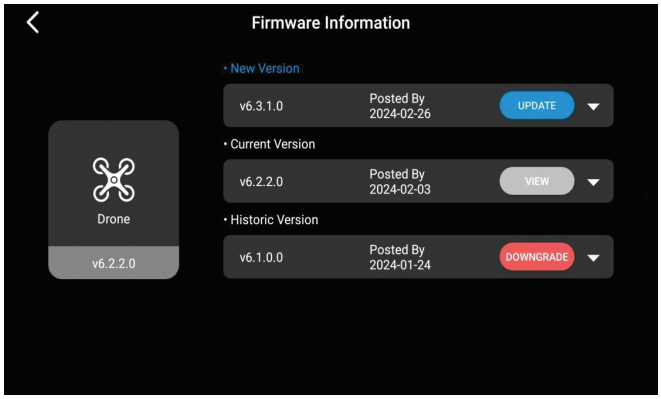
Version Upgrades: The app will notify users when upgrades are available. If ignored, upgrade notifications will no longer appear. If there are firmware updates for the battery, each battery must be updated individually.

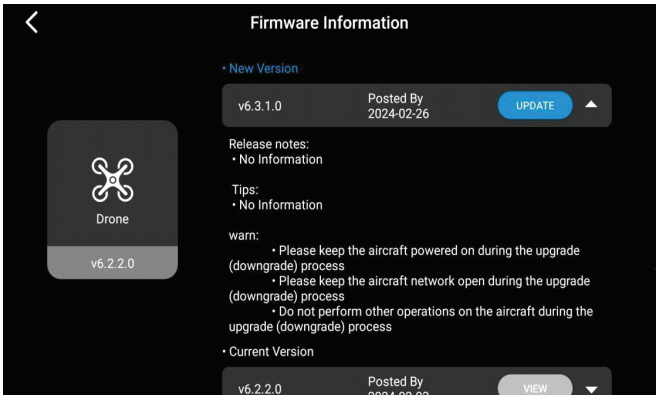


3.20.8.1 Device Information:



Users can click the device icon to view details about the drone or remote controller and perform upgrades or downgrades.

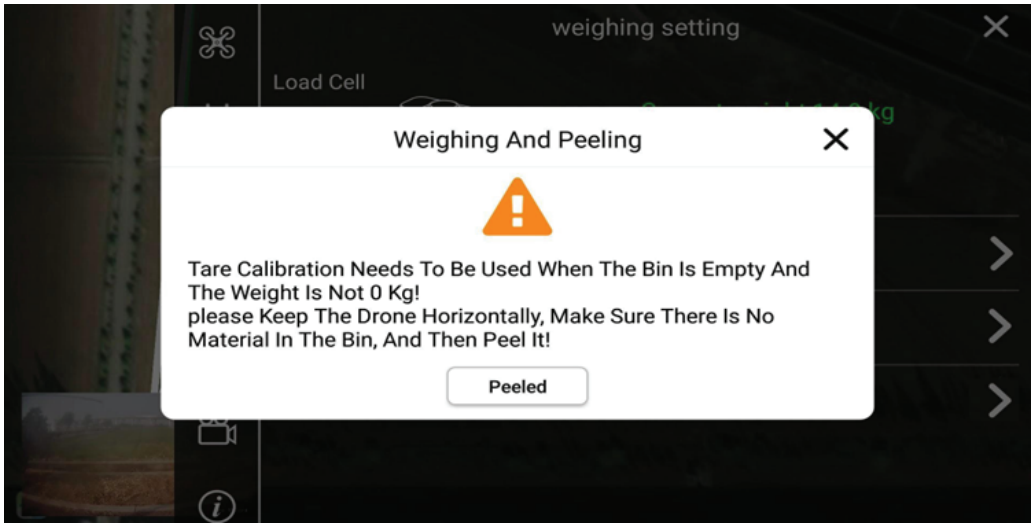




Upgrade Process: During the upgrade process, do not operate the drone. If the upgrade takes longer than 20 minutes, restart the drone and try again. If the problem persists, contact customer support.

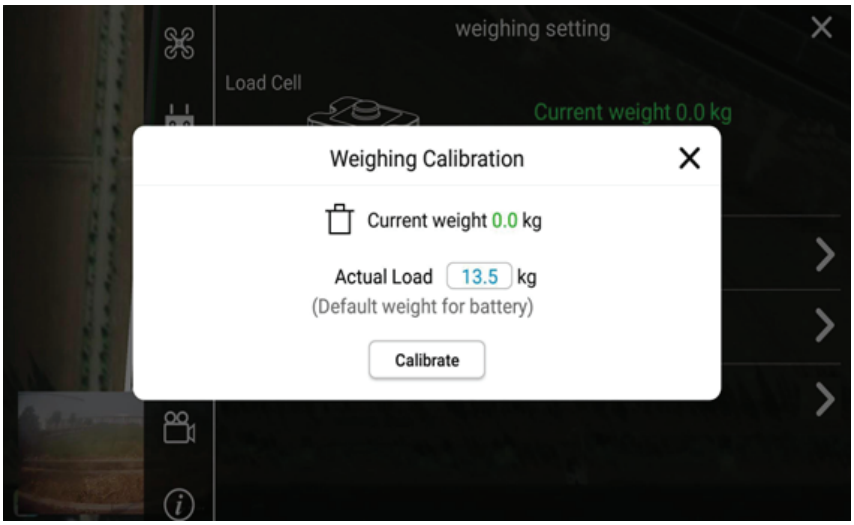
3.30 TARE WEIGHT CALIBRATION

If the app displays a non-zero weight for an empty tank, use the tare weight calibration function. Ensure the drone is level and the tank is empty, then click "Tare Weight Calibration."



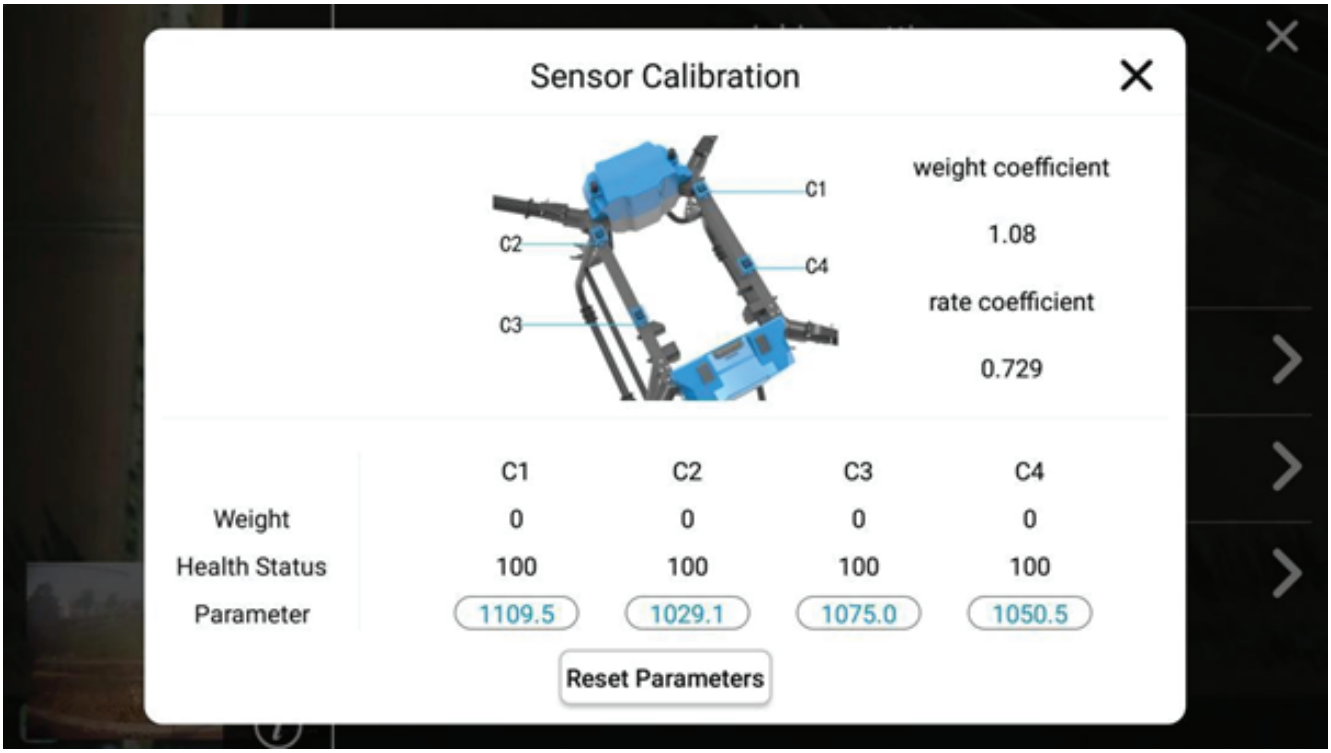
3.30.1 Weight Calibration

Add a specified amount of material to the tank and enter its weight to calibrate the weight sensor.



3.30.2 Weight Sensor Calibration

Input the parameters marked on the weight sensor and click "Reset Parameters."



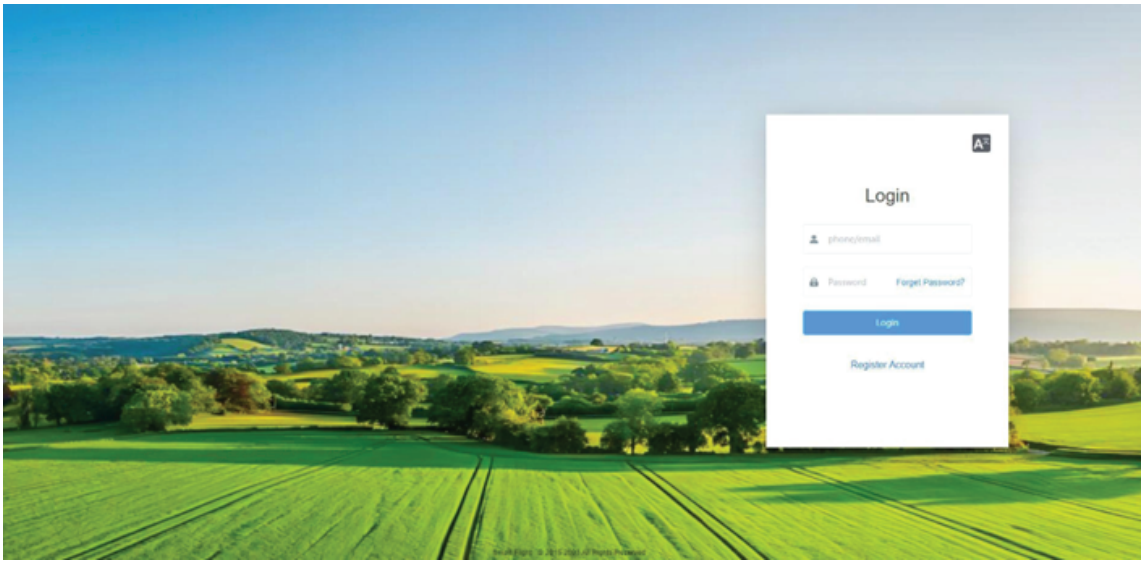
3.31 FLIGHT LOG

In the event of an incident or abnormal flight behavior, users can analyze the flight log to accurately identify and resolve issues.

Online Log Analysis (China only): Flight data can be uploaded via the drone's 4G connection to the cloud-based platform for analysis. Users can request support by providing the drone's ID, the time of the incident, and a description of the problem.

Local Log Upload: Connect the remote controller to the drone using the provided cable to upload flight logs. Ensure that the drone is powered off when copying logs, and be aware that log times are in GMT, which is 8 hours behind Beijing time.

3.32 PC AGRICULTURAL PLATFORM



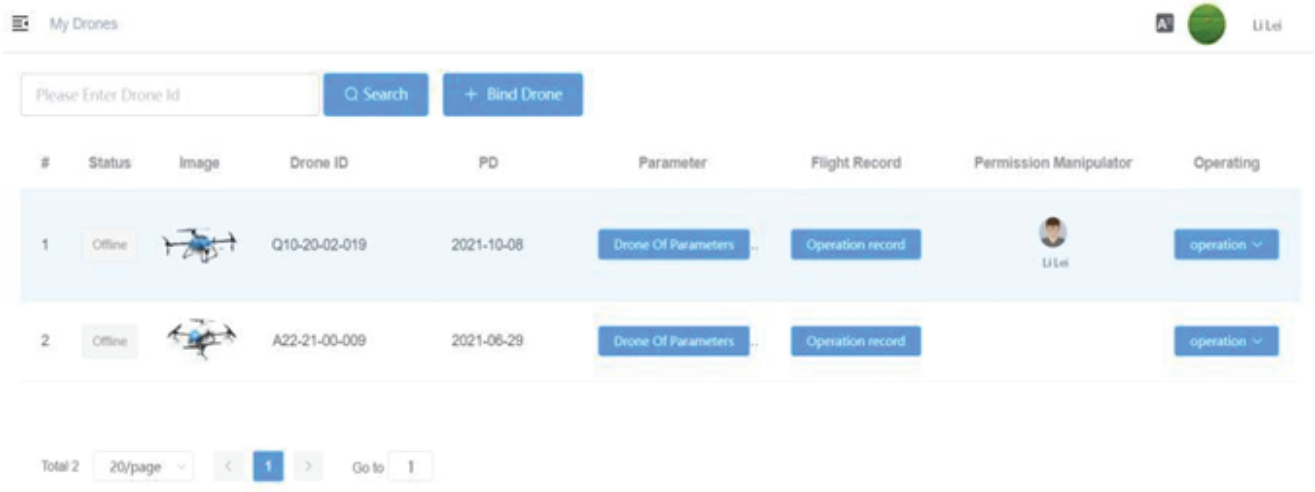
Use the Smart Flight account to log into the management platform http://www.agrobot-uav.com to view real-time drone information, battery statistics, operational data, flight paths, and more.

3.33 MANAGEMENT FUNCTIONS:

Drone Management: View, lock, or bind agricultural drones to your account, and review operation records.

Real-Time Supervision: Monitor drone activity and flight operator status in real-time.

Flight Statistics: View detailed flight and operation statistics, including exportable logs in Excel format. Field Management: Upload, share, and manage planned fields for operations.



4 EMERGENCY PROCEDURES

4.1 LOST LINK OF COMMAND AND CONTROL.

If a non-temporary loss of command-and-control link occurs, the X50 will automatically execute safe return-to-home or landing actions. Multiple fault response strategies are embedded within the flight control logic.

1. The RPIC or PMC will immediately announce loss of command-and-control link to the rest of the crew. The RPIC will immediately take control of the controller.
2. The RPIC will attempt to increase radio connectivity by checking the orientation of the radio antenna, moving to a location with greater radio line of sight, etc.
3. The RPIC will monitor to see if the aircraft initiates a return to home/lost link trajectory. If it does not, announce to crew and commence fly away procedures.
4. If non-participating people are in the path of the aircraft returning home, the RPIC, PMC, and VO will warn others by shouting to any nearby persons of the aircraft returning home.
5. Clear landing area.

4.2 LOSS OF GPS OR AIRCRAFT TELEMETRY

1. The RPIC or PMC will immediately announce to the rest of the crew. The RPIC will immediately take control of the controller.
2. The RPIC will immediately attempt to fly the aircraft back.
3. If unable to manually fly it back, RPIC will announce to crew and commence fly away procedures.

4.3 AUTOPILOT FAILURE

1. The RPIC or PMC will announce to the rest of the crew. The RPIC will immediately take control of the controller.
2. The RPIC will take the aircraft out of auto pilot and manually fly the UA back.
3. If unable to manually fly it back, announce to crew and commence fly away procedures.

4.4 FLY-AWAY (COMPLETE LOSS OF CONTROL)

1. The RPIC or PMC will announce to the rest of the crew the fly away. The RPIC will immediately take control of the controller.
2. The RPIC will attempt to send return to home commands repeatedly in case the aircraft responds. If connection is regained, the RPIC will immediately land at the closest area free of non-participating people.
3. If the aircraft is equipped with a flight termination system, the RPIC will activate it when it will not pose a hazard to non-participating people or moving vehicles on the ground. Continue to Step 6.
4. The RPIC will make note of the time, remaining power or fuel, direction of flight, and altitude.
5. The RPIC, PMC, and VO will keep the aircraft in sight. If VLOS is lost by anyone, the person who has lost sight will communicate the loss of VLOS to the others. The rest of the crew will communicate the position of the unmanned aircraft to aid in regaining VLOS.
6. Based upon the aircraft's trajectory towards:
   a. Airport/Heliport/Gliderport/Seaport - the RPIC will contact ATC or airport manager to warn traffic. The RPIC will communicate to ATC and/or airport manager:
      i. Aircraft's altitude,
      ii. Last known location,
      iii. Direction of flight/heading,
      iv. Fuel on board/battery time
      v. Pilot's intentions, and
      vi. Termination of flight/emergency condition.
   b. Non-participating people - the RPIC, PMC, and VO will warn others by shouting to any persons near the aircraft.
7. The RPIC, PMC, and VO will attempt to locate the aircraft. If found, go to the deviation/accident/crash reporting section of this manual.

4.5 PARTIAL LOSS OF CONTROL

1. The RPIC or PMC will immediately announce to the crew. The RPIC will immediately take control of the controller.
2. The RPIC will attempt to land the unmanned aircraft away from non-participating people and moving vehicles if able.
3. While the aircraft is landing, the RPIC, PMC, and VO will warn others by shouting to any nearby persons of the aircraft.
4. Start the deviation/accident/crash reporting section of this manual.

4.6 FULL OR PARTIAL LOSS OF POWER

1. The RPIC or PMC will immediately announce to the crew. The RPIC will immediately take control of the controller.
2. The RPIC will immediately attempt to land the unmanned aircraft away from non-participating people if able.
3. While the aircraft is landing, the RPIC, PMC, and VO will warn others by shouting to any nearby persons of the aircraft.
4. Start the deviation/accident/crash reporting section of this manual.

4.7 NON-PARTICIPATING PEOPLE OR VEHICLES MOVING INTO THE OPERATIONS AREA

During the flight, if the RPIC, PMC, or VO detects another person or moving vehicle on the ground:

1. The individual who sees the hazard will alert the others and communicate position and direction. The RPIC will immediately take control of the controller.
2. If the:
   a. RPIC sees the person on the ground or the moving vehicle, they will maneuver away from the hazard without flying over it or in front of it.
   b. VO/PMC sees the hazard, they will direct the RPIC away from the person or moving vehicle to a safe location while making sure to not have the aircraft fly over the hazard or in front of it.
   3. If needed, the RPIC will land at a suitable landing area which is an area where there are not any people or obstacles.

4.8 NON-PARTICIPATING AIRCRAFT (MANNED AND UNMANNED)

During the flight, if the RPIC, PMC, or VO detects an aircraft:

1. The individual who sees the aircraft will alert the others and communicate the position and direction of the aircraft. The RPIC will immediately take control of the controller.
2. If the:

a. RPIC sees the aircraft, the RPIC will give way to the aircraft and maneuver away from it to not present a collision hazard. This can be done by flying away from the hazard or by descending in altitude.

b. VO/PMC sees the aircraft, they will communicate to the RPIC directing the unmanned aircraft away to a safe altitude or location.

3. If needed, the RPIC will land at a suitable landing area which is an area where there are not any non-participating people or obstacles.

4.9 LOSS OF VISUAL LINE OF SIGHT

In the event of the RPIC, PMC, or VO losing sight of the aircraft:

1. The party who has lost sight will communicate to the others that they have lost sight of the aircraft.
2. If the person who has lost sight is the:

a. The RPIC, the RPIC will stop the aircraft and spraying and allow the aircraft to hover. The crew will communicate the position of the aircraft to the RPIC. The RPIC can use telemetry from the aircraft to aid in regaining sight.

b. If the PMC loses sight, the RPIC will immediately take control of the controller and stop the aircraft and spraying. The crew will communicate to aid in regaining sight.

c. If the VO loses sight. The RPIC will communicate to the VO the position of the aircraft to aid in regaining sight.

3. Once the person has regained sight of the aircraft, the person will communicate with the others.

4. If the person who originally lost sight of the aircraft believes they have misidentified the aircraft after claiming they have it back in sight, the crew will start the process over again at step 1.

4.10 ENCOUNTERING A NEW OR UNFORESEEN HAZARD

- The RPIC, PMC, and VO will conduct an operational area site assessment of hazards on the ground such as: trees, structures, powerlines, metal wires providing support for structures, holes, slippery surfaces, car lights, or bushes.
- The RPIC will review the hazards with the VO and PMC. The RPIC will avoid the previously identified obstacles.
- During operation, if a new, unknown, or unforeseen hazard is encountered, the RPIC will immediately land and investigate the hazard.

4.11 EVENTS TRIGGERING CEASING OPERATIONS

The RPIC will immediately take control of the controller and cease operations if any of the following happens:

- Safety of human beings or property on the ground or in the air is in jeopardy,
- Any failure to comply with the provisions of the Exemption and/or Waiver exists,
- Communications cannot be maintained between RPIC, PMC, and VO,
- UA control link is lost for longer than 5 seconds,
- A non-participating aircraft enters the designated flight operating area,
- GPS signal is lost for longer than 5 seconds,
- UA GPS location information is degraded,
- Encountering new or unforeseen hazards,
- Battery voltage drops quicker than normal rates,
- If operating at night or beyond line of sight with appropriate approvals, there is a failure of the anti-collision light,
- Encountering smoke or fire from the aircraft or equipment,
- Aircraft Telemetry is Lost. Ground control failing to display for longer than 5 seconds ANY of the following: UA altitude, UA position, UA direction of flight, and UAS flight mode.

The RPIC will communicate to the group about the event and will return the aircraft to land or if necessary, land at the nearest landing area free from non-participating people or vehicles and free of obstructions. Once landed, the RPIC will investigate.

5 WEIGHT AND BALANCE, AND EQUIPMENT LIST

5.1 AIRCRAFT WEIGHT AND PAYLOAD CAPACITY

- Tare Weight (without battery): 43.0 kg
- Battery Weight: 13.5 kg
- Total Weight (with battery): 56.5 kg
- Effective Payload: 50.0 kg
- Max Takeoff Weight: <150.0 kg

5.2 CG RANGE AND BALANCE GUIDANCE

- Recommended CG Position: About 20 cm below battery compartment center
- CG shifts rearward as liquid is consumed; system auto-corrects for stability

5.3 WEIGHT AND BALANCE TABLE

□□□□/Flight Mode	□□□□kg□/Tare Weight	□□□kg□/Battery Weight	□□kg□/Payload Weight	□□kg□/Total Weight (kg	CG□□/CG Shift (cm)
□□□□/Empty Test	43.0	13.5	0.0	56.5	0
□□□□□□/Spray Mission	43.0	13.5	30.0	86.5	+1.5
□□□□/Full Load Mission	43.0	13.5	50.0	106.5	+2.0

5.4 EQUIPMENT LIST - BATTERY AND SPRAY TANK INFO

- Battery: 18S 30000mAh, 13.5kg, 500 cycles
- Tank: 50L (≈50kg liquid), full load recommended

6 INSTRUCTIONS FOR HANDLING, SERVICING, FIELD OR PREVENTATIVE MAINTENANCE, AND INSTRUCTIONS FOR CONTINUED AIRWORTHINESS.

6.1 HANDLING

- Ensure power off before handling, stay clear of props

6.2 GROUND HANDLING

- Maintain 5m distance and conduct pre-flight checks

6.3 DISASSEMBLY, STORAGE, AND REASSEMBLY

- Always power off before removing parts

6.4 BATTERY MAINTENANCE AND CHARGING

- Use the original charger and record cycles

6.5 CLEANING AND CARE

- Clean nozzles, radars, and shell after flight

6.6 FIELD MAINTENANCE (ASTM F2909)

Interval	Item Description
Every Flight	Check Battery, Propellers, GPS Status
Every 10 Hours	Clean Air Frame, Tighten Screws
Every 50 Hours	Replace worn parts, Calibrate Sensors
Every 100 Hours	Full Flight Control System Inspection

7 ASSOCIATED ELEMENTS SUPPLEMENTS

7.1 REMOTE CONTROLLER

7.1.1 Introduction to the Remote Controller

7.1.1.1 Functional Buttons Overview

(1) Antenna

(2) GPS mode lever

(3) Return key

(4) Left control lever

(5) 7-inch display

(6) Turn back

(7) Left lateral shift

(8) Right lateral shift

(9) Handle

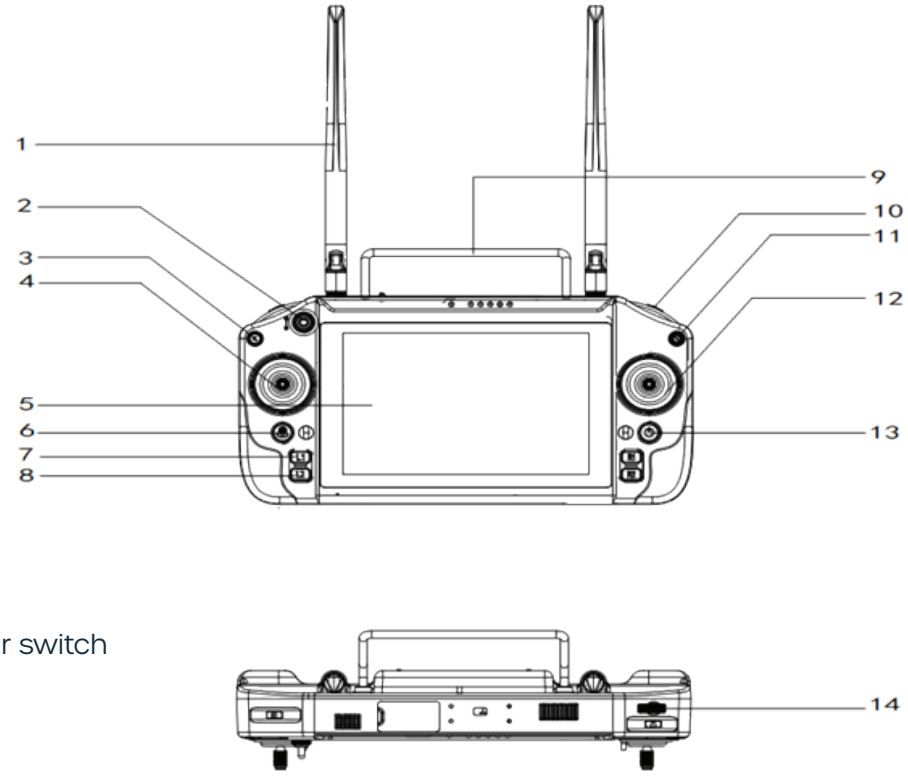
(10) Spraying/pump switch

(11) Obstacle avoidance radar switch

(12) Right control lever

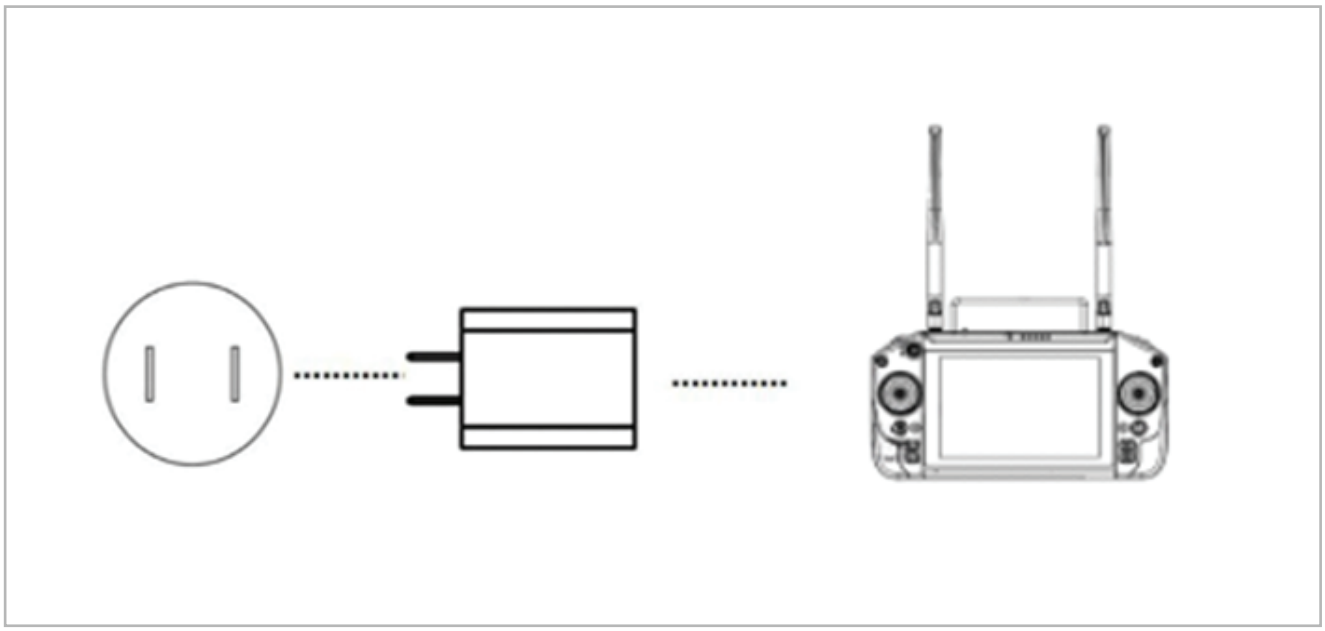
(13) Power button

(14) FPV roller



Remote Controller Charging Steps

- Choose a suitable charger for the remote controller (5V-2.0A).
- Use the included Micro-USB charging cable to connect the Micro-USB port on the back of the remote controller to the USB port of the charger.
- Plug the charger into an appropriate power outlet. When the power button indicator flashes, charging is in progress. Once the indicator turns off, charging is complete.



7.1.2.1 Important Notes:

- Do not use a USB charger with a rated voltage higher than 5V.
- The charging current for the remote controller should not exceed 2A.
- If there is an unusual smell or smoke coming from the remote controller, place it in a safe, open area to prevent fire hazards.
- Do not charge the remote controller if the ambient temperature exceeds 60°C.
- Keep the remote controller out of reach of children and monitor the charging process to prevent accidents