V9-AG Agricultural Flight Control and Management System User Manual (V 1.0)

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Beijing Weike Zhifei Technology Co., LTD
Beijing VK Technology Co.,Ltd

catalogue

1. installation and debugging

1.1 Product List

List of table system modules

Module	picture of real products	explain
Main controller FMU+PMU (standard configuration)		V9-FMU: Dimensions: 73 * 41 * 19 mm Weight: 65 g Power supply: 5 v V9-PMU: Dimensions: 88 * 44 * 16 mm Weight: 75 g Power supply: 20- -100 v
GNSS (standard configuration)		Dimensions: 64 * 64 * 14mm Weight: 60 g pattern:GPS+GLONASS+BD
LED (standard configuration)		LED light refer see Annex 1
remote control (apolegamy)		1）Support Qianxun network RTK and cloud mobile base station RTK dot 2）Optional SIYI & .skydroid

flowmeter (apolegamy) FM-L		Weight: 40 g Pressure resistance: 0.8MPa Electrical strength: AC500V 50Hz
Terrain radar (apolegamy) RADAR-TE		Dimensions: 66 * 74 * 19.3 mm Weight: 110 g Measurement range: 0.5- -30 m
Observer radar (apolegamy) RADAR-OB		Dimensions: 66 * 74 * 19.3 mm Weight: 110 g Detection distance: 1.5- - -20 m Horizontal beam width: ± 17° Vertical beam width: ± 3° Front and rear obstacle avoidance are optional
RTK ground Station (apolegamy) RTK-G-MP		1）Support for mobile base station cloud services 2）Support for Chihiro Network RTK dot-typing (optional) 3）LED light refer see Annex 2
The RTK on-board module (apolegamy) RTK-A-D3H		Dimensions: 85 * 49 * 21 mm Weight: 100 g Power supply: 5 v pattern:GPS+GLONASS+BD Support for dual-antenna direction finding See Annex 4 for lamp language

1.2 System link diagram

Figure: System connection diagram of RTK version
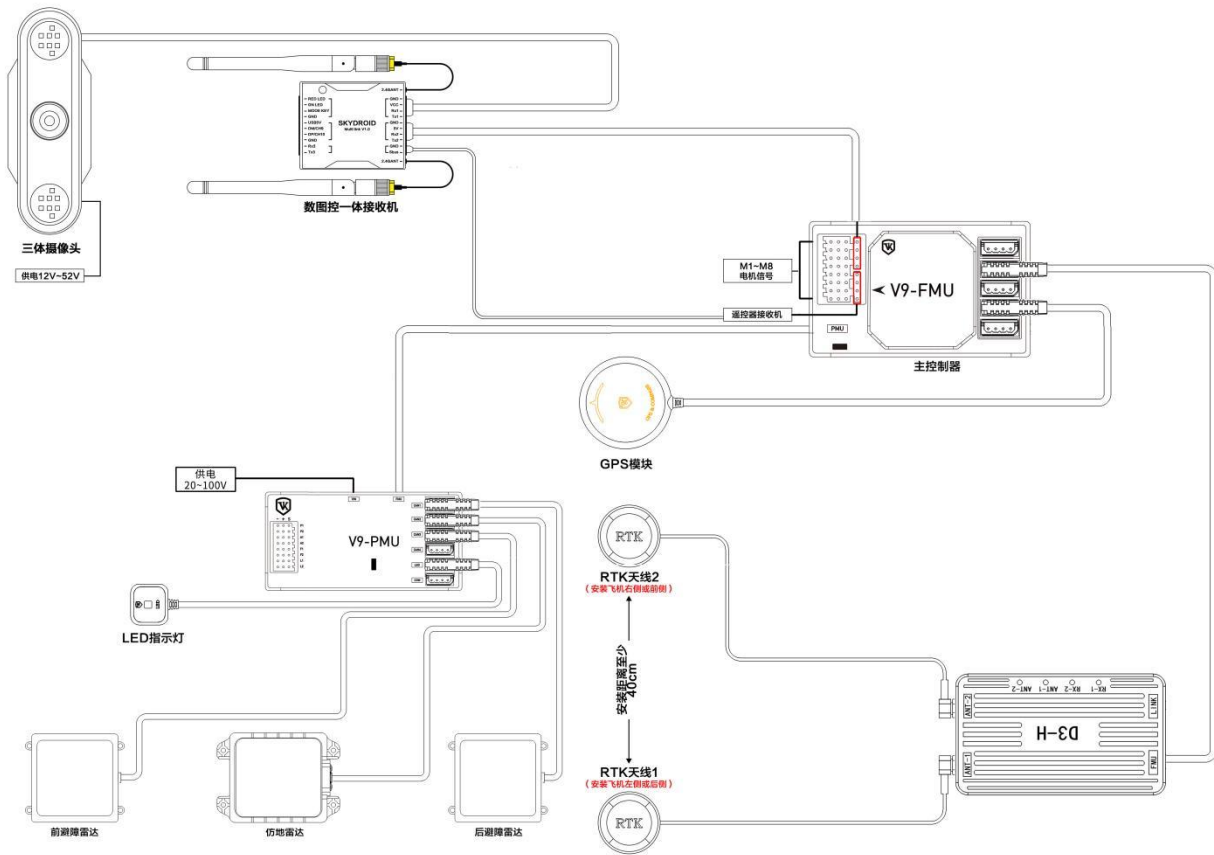
1.3 System installation

1.3.1. Installation of the master controller

Installation Notes:

➢ Install it horizontally on the aircraft panel and in the main center of the aircraft as far as possible to avoid instability during the aircraft flight caused by vibration.

➢ When the main controller is installed, the V9 logo must be printed upward. The installation direction can be divided into four directions: forward, left, back and right; the default is forward installation, and the small triangle logo tip angle should be consistent with the direction of the aircraft head. If the right direction installation is set, the small arrow should point to the right side of the aircraft, as shown in the figure below

Figure: Main controller installation direction

机头方向

前向安装   左向安装   后向安装   右向安装
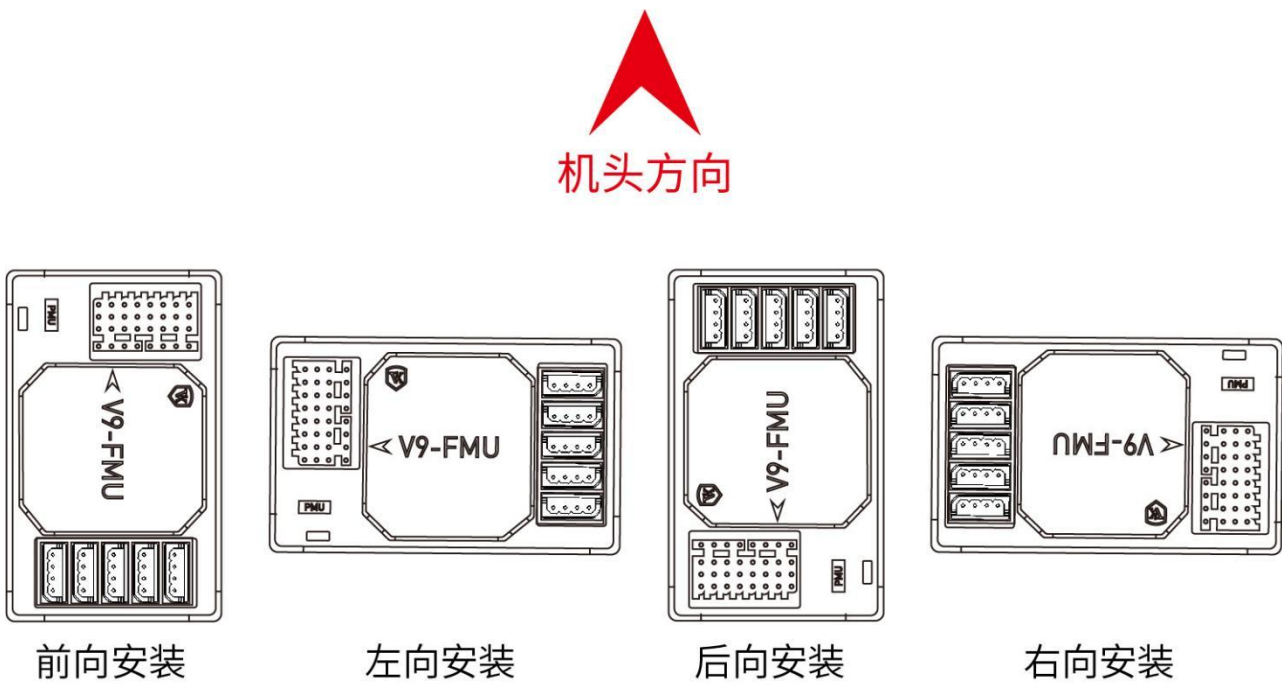
After the main controller is installed, the GNSS module, LED module, electric regulating signal line, water pump, flow meter and other equipment need to be connected to the main controller.

Note: only connect the signal and ground to the main control unit.

Figure: Main controller pin definition

FMU接口定义
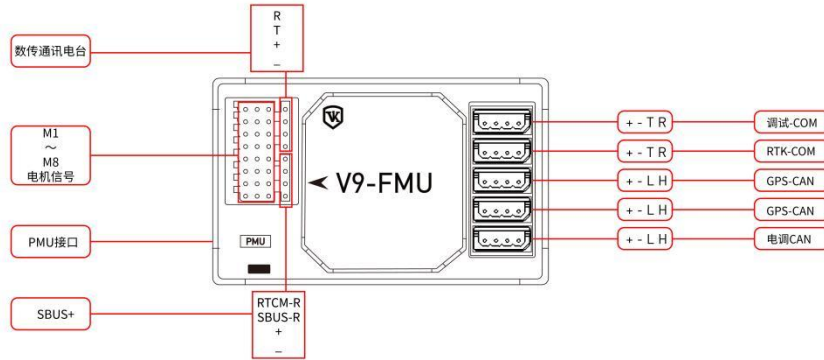
PMU接口定义
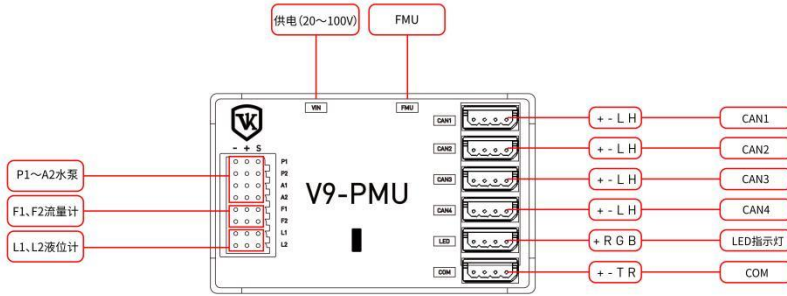
The V9-AG flight control system supports various plant protection aircraft models, and the main interface functions are described as follows:

Table: Function description of the main controller interface

V9-FMU port	function declaration	The V9-PMU port	function declaration
Digital communication station	Connect transmission link (receiver Link)	VIN	Power supply (20-100 v)
M1~M8	Motor interface # 1-8	FMU	Connect the FMU (XT30 2 + 2 wire)
PMU joggle	Connect the PMU (XT30 2 + 2 wire)	P1	Pump 1
SBUS+	SBUS-R + -Connect to SBUS line	P1	Pump 2
	RTCM-R connects the Rtcm data	A1	Centrifugation of the nozzle 1
Electric can	Connect the electrical modulation that supports CAN communication	A2	Centrifugation of the nozzle 2
GPS-CAN	Connect the GNSS master / slave module	F1	Flow meter 1
GPS-CAN	Similarly, the two GPS-CAN are common	F2	Flow meter 2
RTK-COM	The RTK device is connected to the D3-H	L1	Disoff / material sensor 1
test-COM	Standby string mouth	L2	Drug break / material sensor 2
		CAN1~4	CAN equipment (12v output)
		LED pilot lamp	LED module
		COM	Standby string mouth

remarks:

The FMU RTK COM line sequence colors are as follows:
    5V (red) -GND (brown) -T1 (orange) -R1 (yellow)
The PMU CAN1~4 line sequence colors are as follows:
    12V (Red) - -GND (Brown) -CANL (Orange) -CANH (Yellow)

1.3.2 GPS installation

Installation Notes:

➢ When installing the GPS module, the marked side must be faced up, and the small triangle logo has pointed corners aligned with the aircraft nose.

➢ The GPS module is a magnetic sensitive equipment, and the installation and use should be far away from other electronic equipment and strong magnetic substances, and the frame is high in the body plane of more than 10cm.

1.3.3 Dual-antenna RTK installation

➢ The two antennas of the RTK module must be front (after 1, before 2) and right (1, left, 2, right), and should be set correctly on the APP.The module is antenna 1 with ANT1 and antenna 2 with ANT2.

➢ The distance between the two antennas is greater than 40cm

Figure: Schematic diagram of the dual-antenna RTK installation
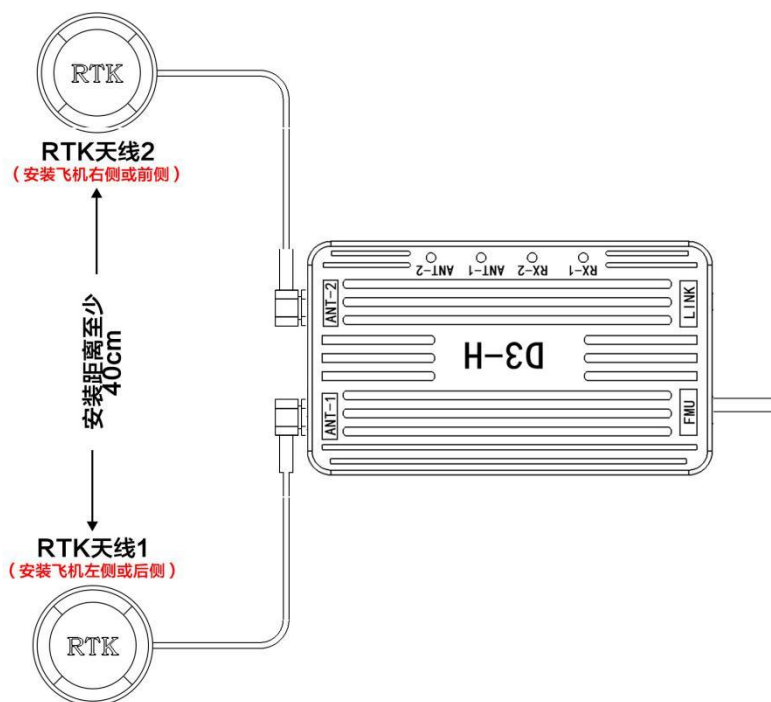
1.3.4 Radar installation

➢ The imitation radar is installed horizontally at the bottom of the aircraft, without any shielding at the bottom of the radar

➢ The obstacle avoidance radar is mounted on the front / rear of the aircraft, with the back bar heat sink facing up and 12 degrees up

Figure: Diagram of obstacle avoidance radar

避障雷达安装说明

豁口处向上安装

避障雷达安装角度在0°~12°范围内，建议安装角度为12°，从而使避障效果达到最佳。

12°   12°

6°

上下扫描范围6°

34°

左右扫描范围34°

UAV-R21-F
10200496520001

UAV-R21-B
10200496520001

编码后缀为'-F'此雷达为前避障雷达   编码后缀为'-B'此雷达为后避障雷达
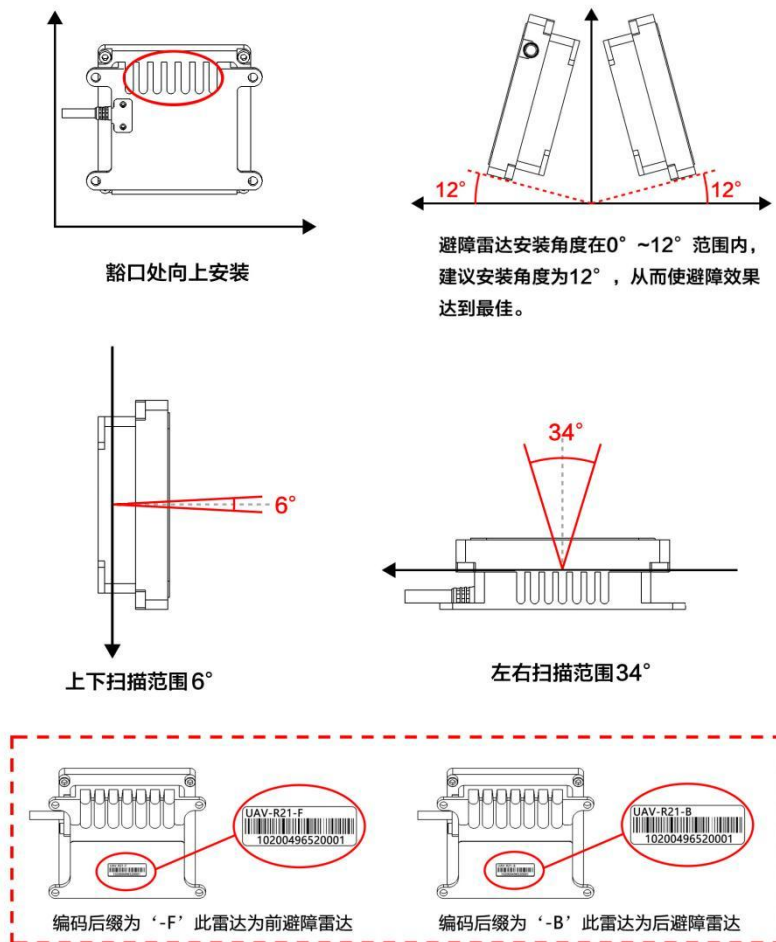
1.4 APP installation

Microgram agricultural service system APP can run on Android 4.2, and can be directly scan the following QR code to download and install.

APP address: http://cloud.jiagutech.com/upgrade/vk-ags2.html

Figure: APP installation of a QR code

After the installation is completed, the individual operator can register the new users directly on the APP.

*Manufacturer / enterprise operator please refer to the **4.1 account registration** section for user registration.*

1.5 Functional inspection

After connecting the wiring of the system module, it is necessary to check whether the module link and the function are normal. The function check must be completed under the paddle unloading conditions, as follows:

1.5.1 Communication inspection

Power the aircraft and the remote control (the remote control needs to switch the communication mode to compatible microgram fly mode, which can be set on the remote control APP). Open the microgram service APP and enter the Settings- -> Remote Control Settings- -> Bluetooth connection. Select Bluetooth for the remote control and prompt voice

"Remote connected". The rudder volume of each channel of the remote control can be viewed on the channel check page; and the flight control status information can be viewed on the debugging page.

When no channel data appears after connecting the remote control, please check:

1，Check whether the remote control and the receiver match the frequency successfully.

2，Check whether the connection between flight control and receiver is correct, flight control Tx connects receiver Rx, and flight control Rx connects receiver Tx.

3，Check that the receiver's communication rate is correct. Or click on the receiver Settings button in the upper right corner of the remote control setting

4，Check if the flight control is in the upgrade state.(LED white light 5 flash, AP reports upgrade upgrade)

1.5.2 Remote control calibration

Check the rudder volume of each channel of the remote control against the channel check page in the APP to check whether the rudder volume of each channel of the remote control needs to be reversed. If the positive and negative definition of the channel does not comply with the APP display, the reverse rudder quantity should be set in the adjustment software of the remote control. Check whether the rudder volume range of channel 1-4 range is between (100,200), and whether the rudder volume of channel 5-8 range is between (110,190), and the channel error cannot exceed 3%. Over 3%, the APP will

display red letters.Remote control calibration is required. The calibration steps are as follows:

➢ First, the positive and reverse direction of each channel is completed and correct. The fine tuning of all rocbars on the remote control returns to zero, and all channel curves are set to default.

➢ Place the joystick and dial key switch (1~8 channel) to the median, click the remote control calibration button in the A PP channel check page to enter the remote control calibration mode, the APP will remind all the joystick and dial rod to the median, click the confirmation button, the APP will broadcast the remote control calibration voice, the LED indicator is purple light 3 flash ⬤⬤⬤, to enter the remote control calibration mode, and then push the joystick or dial key corresponding to all channels (1~8 channel) to move to the maximum working range and repeat several times.

➢ After completing the above operation, click the OK button on the A PP interface to exit the remote control calibration mode. The LED light flashes normally (the purple light is off), and then the calibration is completed.

After completing the remote control calibration, check whether the setting and calibration are correct according to the written instructions for the different rudder volumes on the APP.

Video tutorial address: https://www.bilibili.com/video/BV1DZ4y127yf?spm_id_from=333.999.0.0

1.5.3 Motor inspection

1) Electric adjustment and calibration

Remove the blade, push the ailerons and throttle of the remote control to the maximum simultaneously, and then power the flight control and the electric adjustment at the same time, when the flight control will enter the electric adjustment calibration mode, the purple light 4 flash ●●●●. Electric adjustment will make a didi sound, at this time has entered the electric adjustment calibration mode, the wing back, the throttle pulled to the lowest, electric adjustment issued a dripping sound, electric adjustment calibration is completed.

FOC motors not support calibration or not require calibration

Hazard tip: After the calibration, the throttle in the flight control is in direct-through mode, and there is no need to unlock the push oil and electric opportunity to turn, and it must be carried out under the condition of unloading the paddle.

2) Motor inspection

Connect the aircraft power battery, enter the motor inspection page, and click the check button after the motor 1- -8, to check whether the steering of the motor is correct.

If the signal output appears on the motor inspection page on the APP, but the motor does not turn, try to raise the motor idle speed level in the advanced setting- -> algorithm parameters.
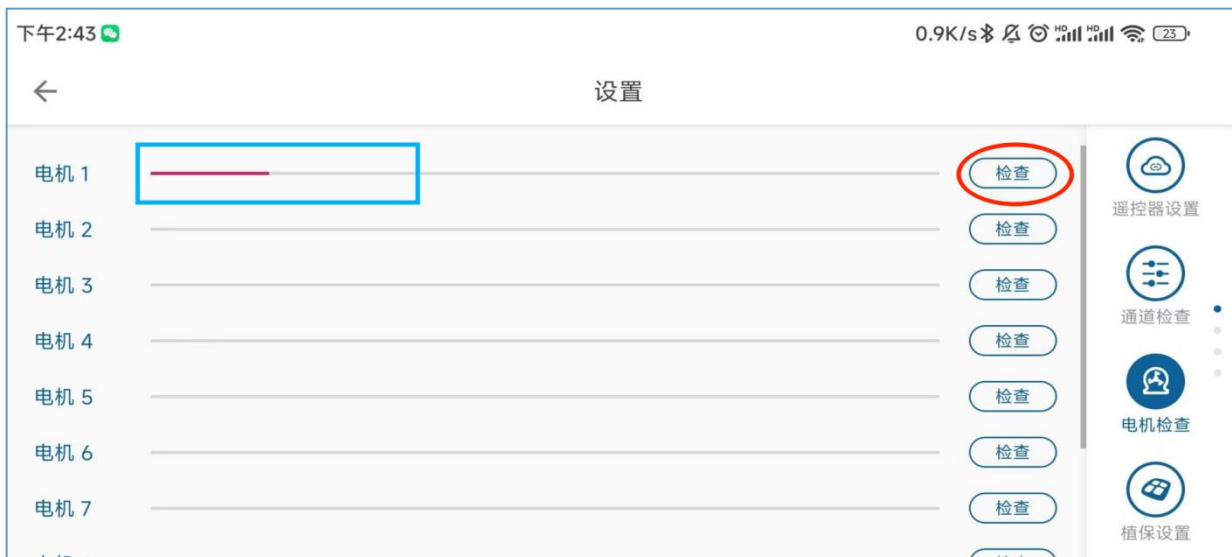
1.5.4 Flow meter calibration

To enable accurate spraying, the V9-AG system provides flow meter calibration.

1）Traffic meter calibration

Fill the medicine cabinet with water, such as at 10L, and fill the tank accurately to 10L. Enter the water pump calibration page, the medicine cabinet capacity to fill in 10, the coefficient to fill in 0, and then click the calibration flow meter, then the water pump will automatically work to spray water, until the water tank after spraying, wait for the water pump to automatically close, to complete the calibration of the flow meter.

2）Pump calibration

Water pump calibration is not supported temporarily

Video tutorial address: https://www.bilibili.com/video/BV1w54y1n742?spm_id_from=333.999.0.0

1.5.5 Flight calibration

1) Voltage calibration

The power battery voltage detected by the flight control system may be somewhat different from the actual voltage of the battery. At this time, you need to do the voltage calibration. The real voltage of the battery is filled in at the real voltage of the flight calibration page, and click the calibration to complete the voltage calibration.

Note: the large voltage gap cannot be calibrated, and the reason for the large gap needs to be checked.

2) Horizontal calibration

Because the installation plane and body plane, horizontal calibration is required, otherwise the flight performance will be affected. Place the plane on the horizontal plane to

ensure the basic level of the plane. If the attitude angle of the plane is more than 2 degrees of deviation, the horizontal calibration is required. Enter the advanced setting- -> flight calibration- -> - -To confirm the level, then you will find that the previous angular deviation will be cleared, and the horizontal calibration is completed.*(Factory will do horizontal calibration, generally do not need horizontal calibration)*

3）Level calibration page in advanced setting, can be set with GPSA and GPSB (main and secondary GPS, it is not recommended to set privately, contact us before setting)

4) Positioning system type and battery type: set according to the actual type used by the aircraft.

1.5.6 Parameter setting (preliminary)

Parameter setting is very important, setting errors will directly cause crash accidents, be sure to confirm carefully. Enter the advanced Settings, (the manufacturer account has the advanced Settings option.) Select the correct plant protection machine model, and confirm whether the motor serial number and steering are consistent with the drawing; enter the algorithm parameters, and ensure that the flight control installation method is consistent with the actual installation. Default 3 can be selected for noise suppression in

the first test flight; GPS installation deviation is the distance from GPS installation position to the aircraft center, which is positive on the right of X axis, positive in front of Y axis and positive on Z axis.
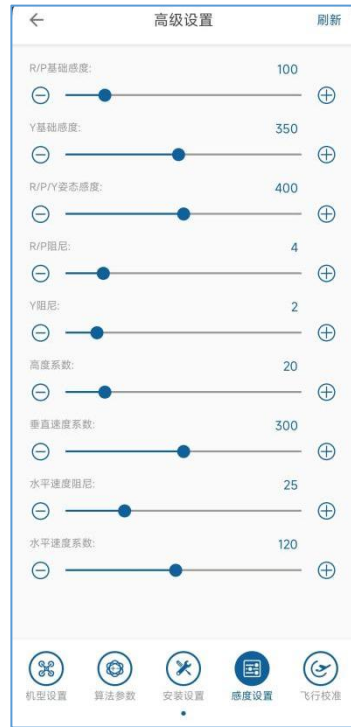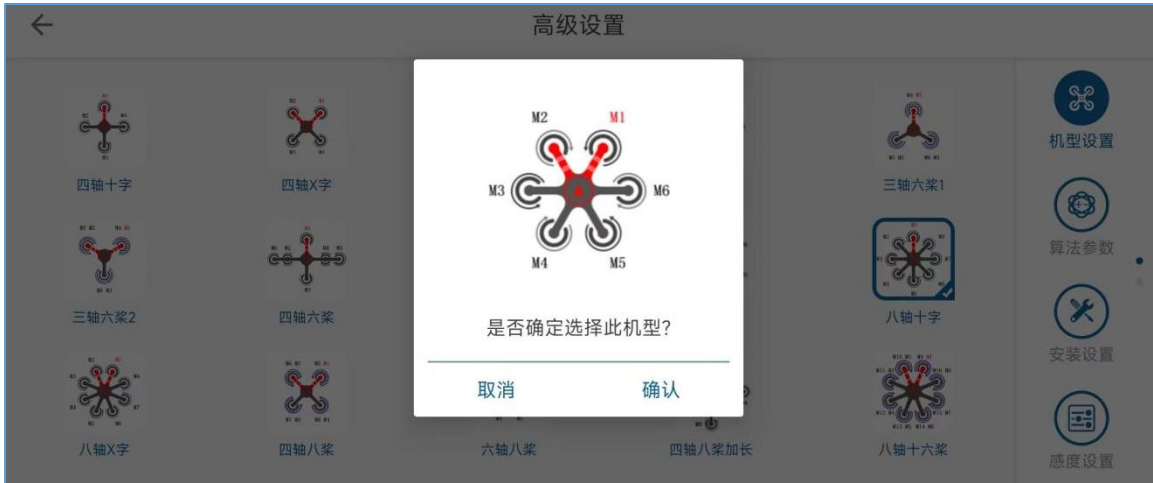
2.flight debugging

2.1 Magnetic compass calibration

After the installation and inspection work is completed, you can go to the outfield for the

test flight test. Before the test flight, a magnetic compass calibration must be made, and the calibration method is as shown in the figure below:

➢ Connect the remote control, enter the flight calibration page in the APP, click the geomagnetic calibration button, the LED indicator light becomes green, and enter the horizontal calibration mode.

水平旋转
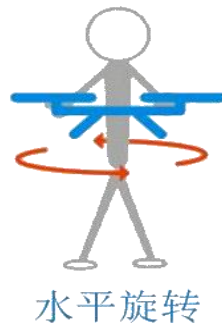
➢ Calibrate the vehicle horizontally until the LED indicator turns blue and enters the vertical calibration mode.

竖直旋转
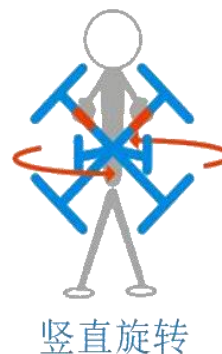
➢ The head is vertically up and then rotates. LED indicates the blue light to flash calibration successfully, and LED indicator to red light fails to be recalibrated.

2.2 Unlock / add a lock

Outside eight unlock: waiting for the star search is good, the APP has no alarm display, the remote control outside eight operation to unlock the plane, unlock after the propeller will turn up. In the plane will increase the throttle to take off.

Inside eight lock: after the plane landing to pull down the throttle will automatically lock,

can also be manually inside eight lock, inside eight lock is effective at any time, in the air can also be locked in eight lock.

Figure: Remote control unlock / locking diagram
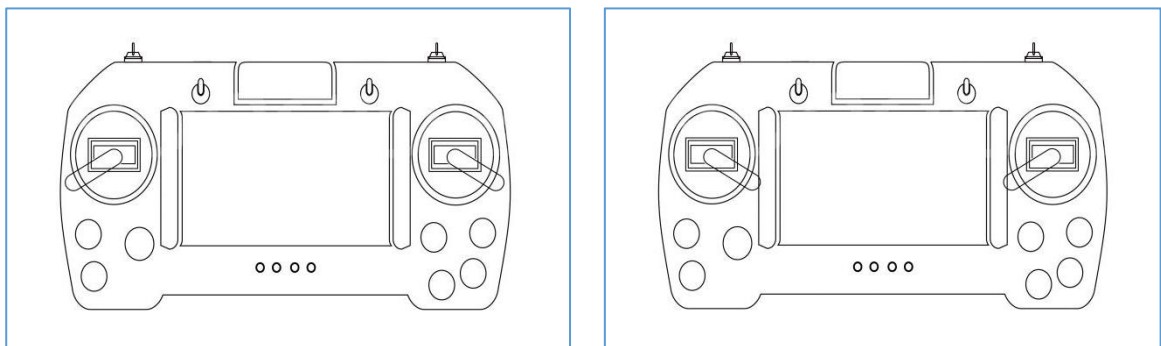
2.3 Sensory debugging

For the first test flight, please confirm that all of the above Settings are set correctly, in the open room, wait for a good star search, unlock in GPS mode, take off to check the flight status in the air, in further parameter tuning.

Instructions for reference:

① R / P base sensitivity: In attitude mode, first adjust the base sensitivity, with the default value of 120 (please set this parameter to 100 for aircraft above 30 inch paddle). In the attitude mode, try to not move the pole and observe the self-stability ability of the aircraft. The simple method is to hit the pole back in a small range to see whether the aircraft can quickly recover the level. If not, then increase the value of 5 each time. Increasing this sensation until the aircraft has a slight shake, and then lowering it by 20% is appropriate. Try not to exceed 180, otherwise there will be a greater risk of self-shock oscillation.

② Y base sense: heading base sense adjustment method and roll / pitch base sense similar, manual heading to follow slow can increase this parameter, generally the default value of 260 can meet the requirements of flight, if the feeling heading stability ability is not enough, performance in the case of wind, heading a little turn, then at the same time to add 10 value increase this parameter.

③ R / P / Y attitude sense: attitude sense is the parameter of adjusting the aircraft to follow the flight command, that is, the mobility performance of the aircraft during flight. In the case of good base sense debugging, fast stroke / full rudder stroke, to see whether the aircraft can quickly perform the Angle response (the maximum angle limit is 20 degrees in attitude mode). If you feel that the response of the aircraft is relatively slow, then this parameter can be increased, and the attitude sense should not exceed 600.

④ R / P damping: This coefficient increases the stability of the aircraft and prevents self-shock oscillations to some extent. If the base / attitude perception in the base parameter cannot be controlled anyway, try to set this parameter to 0. Generally, the default 3 or 4 can meet the flight requirements. When the Angle is back in the attitude mode appears in the middle position slightly shaking can smoothly increase this value, add 1 each time, try not to exceed 10.

⑤ Y damping: This coefficient is for increasing the stability of the heading channel. Default 3 or 4 meets the flight requirements.

⑥ height coefficient: the default 20 can meet the requirements. If the vibration of the aircraft causes the large output of the motor is obviously not smooth enough, and the motor is quickly added or reduced, these two parameters can be reduced to 15 or 10.

⑦ vertical speed coefficient: adjust the response speed of the throttle, the greater the sense, the faster the throttle response, the smaller the sensitivity, the slower the response, the general aircraft 350

value can meet the requirements.

⑧ horizontal speed damping: if the vehicle is not well suspended and the position drift is large, this parameter can be appropriately increased (not large with 50).

⑨ horizontal speed coefficient: default 120, in GPS position mode, if the speed following response is not enough, this parameter can be appropriately increased (not more than 150); if the speed follows the overshoot, this parameter can be appropriately reduced (not less than 80). In GPS mode, too large braking angle can reduce this parameter, and too slow braking can increase this parameter.

⑩ brake coefficient: Default coefficient of 20. The larger the coefficient, the more sensitive the brake, and the opposite.

3. work tasks

The top status bar shows the current status of the UAV.

Status display bit:

①: Battery power, click on the battery power icon will appear in the engine details page

②: Height information, ground height above and altitude below

③: Flight speed, horizontal speed size

④: Distance from home, distance from the HOME point

⑤: For GPS stars, click the GPS star number icon to pop up the box 14 and display the satellite / radar information

⑥: Flight time, the power outage is reset

⑦: Flow rate information, flow rate of pump in L / min

⑧: acres of operations, current acres of operations / total acres of land

⑨: Operating dosage, dosage information already sprayed, unit L

⑩: signal quality, information quality of communication between remote control and aircraft

Box 11: alarm display position showing the current alarm state of flight control, no alarm status if no alarm information

Box 12: Mode display bit, showing the flight mode of the current aircraft

Box 12: Equipment information bit, showing the connection and basic information of the current aircraft equipment

Box 13: Notification information bit, some notification information is displayed through this box.

Box 15: Command operation position, in turn, return, landing, AB angle (set the angle to AB point when AB points)

Box 16: Barrier avoidance and ground protection switch button

Box 17: Clear the AB point

Box 18: Go to the setup interface

Box 19: One-click center

3.1 AB point mode

AB mode automatically copies AB routes for flight after users define points A and B. In AB mode, it supports radar ground imitation flight, support manual obstacle avoidance,

support automatic obstacle avoidance of front and rear radar, support the adjustment of AB route length during flight, support manual altitude adjustment (throttle median default height flight) and nose direction.

3.1.1 AB point operation process

➢ AB click again, click the clear A B point button in the A PP manual operation interface to clear the last AB point information and ensure that there is no AB point inside the aircraft (if AB point exists, LED will have purple light flashing).

➢ Take off manually and fly to the first start point. In the G B P S hover mode, the AB dot channel (CH6) dial switch dials from standby to point A to record the A point coordinate. The APP will report the successful A point record, and the LED light will be 1 flash light.

➢ When the plane flies to point B, the water pump will automatically turn on during the flight. In GPS hover mode, AB dot channel (CH6) dial switch dials from point A to point B to record point B coordinates. After point B record success, APP will report point B record success, and LED light will be 2 flash light.

➢ After the record is completed, the mode channel (CH5) dial switch is dialed to the AB mode, and then the roll channel gives a left / right full rod action, when the AB mode starts to execute, and the plane will continue to fly to the left / right ridge.

➢ Exit AB mode requires the mode channel (CH5) dial switch to dial to GPS mode / attitude mode to exit AB mode (the AB dot channel (CH6) is still in the B point of position, it is recommended to return to the default position). To re-record the AB point, click the clear A B point button in the A PP manual job interface to clear the last AB point, when the 2-flash light of the AB point goes out, indicating that the clearance is successful.

➢ After the current AB operation returns home, if the AB breakpoint needs to fly again, the AB point does not need to be clear. Only after taking off in the GPS mode, the mode channel (CH5) switch is dialed to the AB mode, and the aircraft automatically flies to the last breakpoint position to perform the operation.

Figure: AB point operation schematic diagram

向左侧   向右侧

• 航线节点
---- 航线间距
> 行进方向
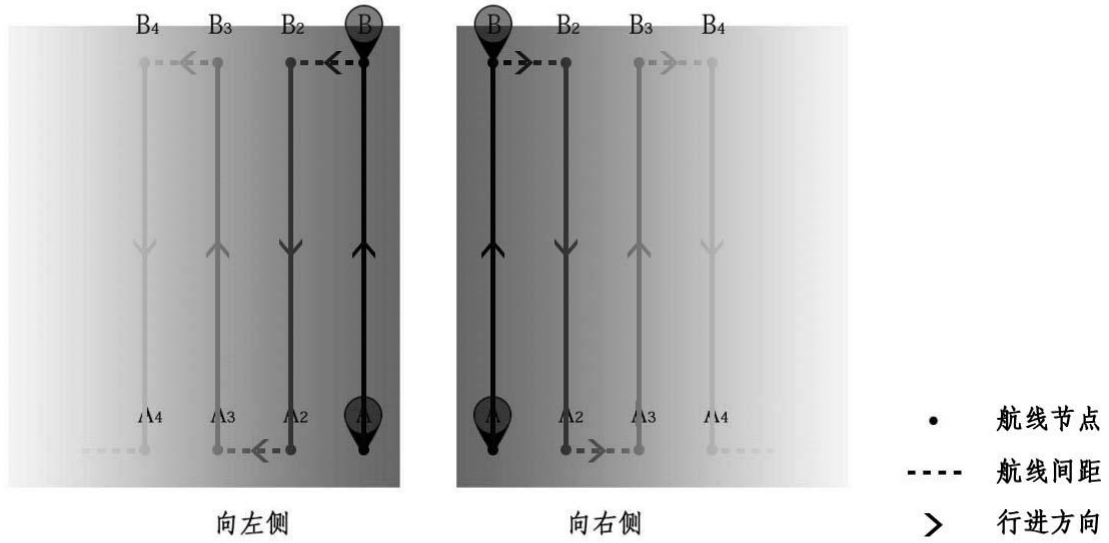
3.1.2 Real-time adjustment during flight in A B mode

1) Adjust the length of the ridge

To accommodate irregular plots, AB point length can be adjusted in real time by pitch rod during flight. Adjust the operation as follows:

➢ The extension of the AB point: When the plane flies to the edge, push the pitch rod (push or pull, the far end is to push, the near section is to pull), the plane will slowly advance at the speed of 2 m/s, when reaching the extended position, the pitch rod returns, the plane stops, and then start to copy the corresponding route, the AB point extension is completed.

Figure: Operation of extension at point AB
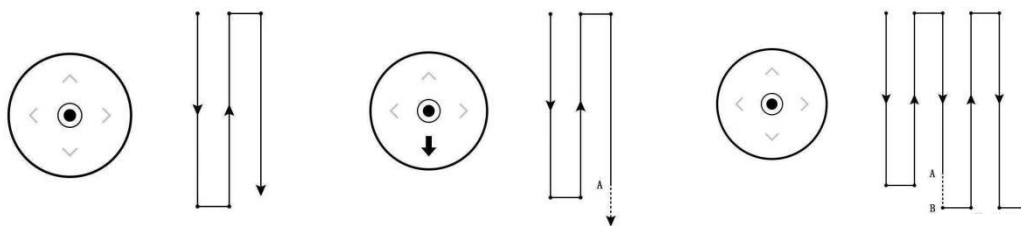
➢ AB point shorten: when the plane flew to the distance to shorten the position close, dial the pitch rod (push or pull, far to pull, near section to push), the plane will slowly forward at the speed of 2 m/s, when quickly reach the extended position, the pitch rod, the plane stopped, and then began to copy the corresponding route, AB point shortened.

Figure: Shoroperation shortened at point AB
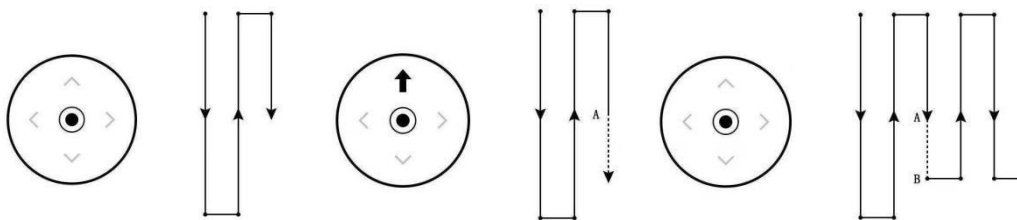
2) Adjust the height

During the flight, the median throttle is the high flight (with radar, the relative altitude imitation flight), the throttle push the height rises, the throttle down the height drops.

3) Adjust the direction

During the flight, lock the median nose in the flight, push left to the nose left, and push right to the nose right.

3.1.3 The AB mode continues to fly

When the AB mode flight, the current dose is low or low voltage returns, the last AB point should be continued after redressing.The AB breakpoint is continued as follows.

Take-off manually, in GPS hover mode, the mode channel (CH5) dial switch dial to AB mode, when the aircraft enters the breakpoint continuation mode of AB mode, fly up once the AB mode exit, and then continue to perform AB operation.

Figure: AB point operation flight
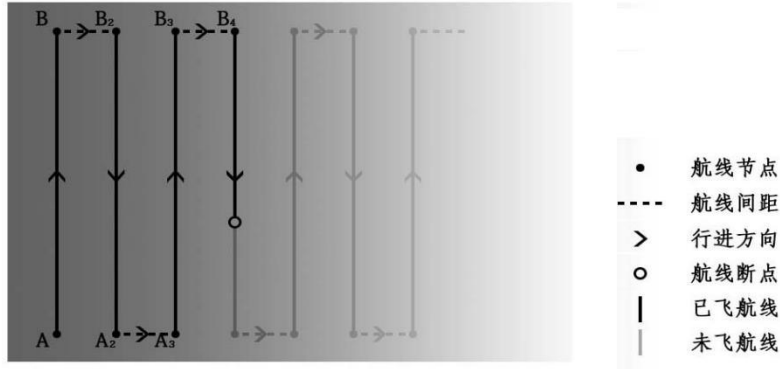
3.1.4 AB mode for obstacle avoidance

1) Manual obstacle avoidance

　　In the AB operation, when the obstacles in front, first dial the roll rod, the plane will enter the manual operation mode, and then to the direction of the dial roll rod translation, translation to the safety offset, can perform the pitch rod operation, bypass the obstacles, and then all the pole position, the plane will automatically return to the AB mode, and then the subsequent operations.

Figure: Manual obstacle avoidance at point AB
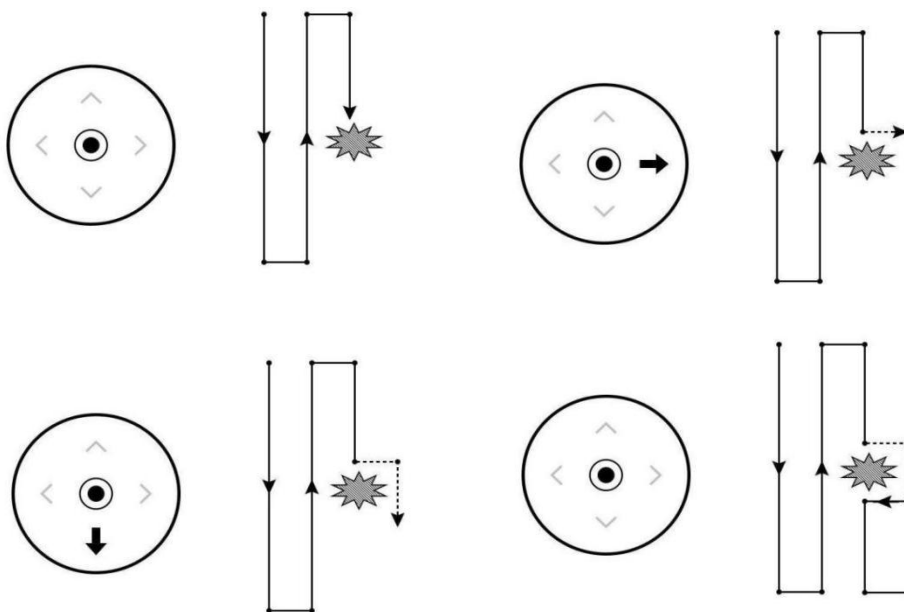
2) Automatic obstacle avoidance

If the aircraft is equipped with an obstacle avoidance radar, when the radar detects obstacles ahead / rear, the aircraft will automatically hover / detour according to the obstacle avoidance action set on the APP. If the hover is selected, the plane will hover automatically, and then the remote control can directly enter the manual obstacle avoidance mode; if the detour is selected, the plane will shift to one side until there are no obstacles ahead, and then fly forward with twice the obstacle avoidance distance of + 5 meters, as shown in the figure below:

Figure: Operation radar obstacle avoidance at point AB
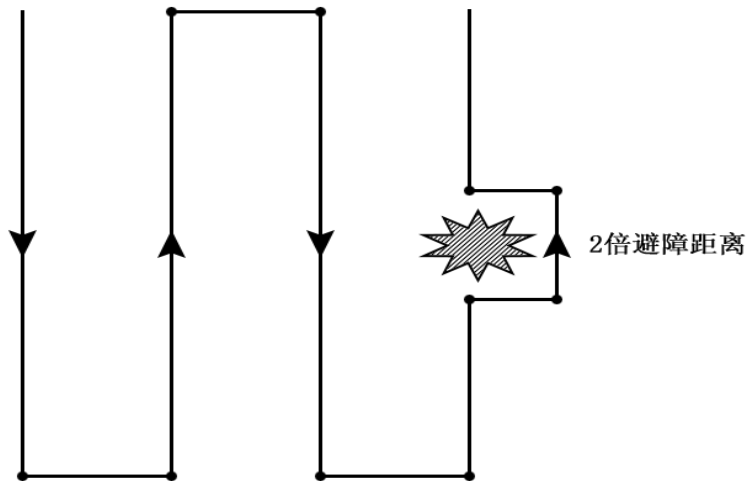
3.1.5AB-T pattern

To facilitate the use of AB mode operations in fields that are not at right angles, the AB-T mode was added according to the AB mode.Adjust the Angle of AB points to change the aircraft route and adapt to more complex plots.

AB-T job flow

➢ AB click again, click the clear A B point button in the A PP manual operation interface to clear the last AB point information and ensure that there is no AB point inside the

aircraft (if AB point exists, LED will have purple light flashing).

➢ Take off manually and fly to the first start point. In the G B P S hover mode, the AB dot channel (CH6) dial switch dials from standby to point A to record the A point coordinate. The APP will report the successful A point record, and the LED light will be 1 flash light.

➢ **After successful point A recording, the in situ rotation nose is aimed at another ground edge in AB direction. Click the AB Angle button to record the angle of point A.**

➢ When the plane flies to point B, the water pump will automatically turn on during the flight. In GPS hover mode, AB dot channel (CH6) dial switch dials from point A to point B to record point B coordinates. After point B record success, APP will report point B record success, and LED light will be 2 flash light.

➢ **After successful point B recording, the situ rotating nose is aimed at the other ground edge except in the AB direction. Click the AB Angle button to record the angle of point B.**

➢ After the record is completed, the mode channel (CH5) dial switch is dialed to the AB mode, and then the roll channel gives a left / right full rod action, when the AB mode starts to execute, and the plane will continue to fly to the left / right ridge.

➢ Exit AB mode requires the mode channel (CH5) dial switch to dial to GPS mode / attitude mode to exit AB mode (the AB dot channel (CH6) is still in the B point of position, it is recommended to return to the default position). To re-record the AB point, click the clear A B point button in the A PP manual job interface to clear the last AB point, when the 2-flash light of the AB point goes out, indicating that the clearance is successful.

➢ After the current AB operation returns home, if the AB breakpoint needs to fly again, the AB point does not need to be clear. Only after taking off in the GPS mode, the mode channel (CH5) switch is dialed to the AB mode, and the aircraft automatically flies to the last breakpoint position to perform the operation.

Figure: AB-T pattern schematic diagram
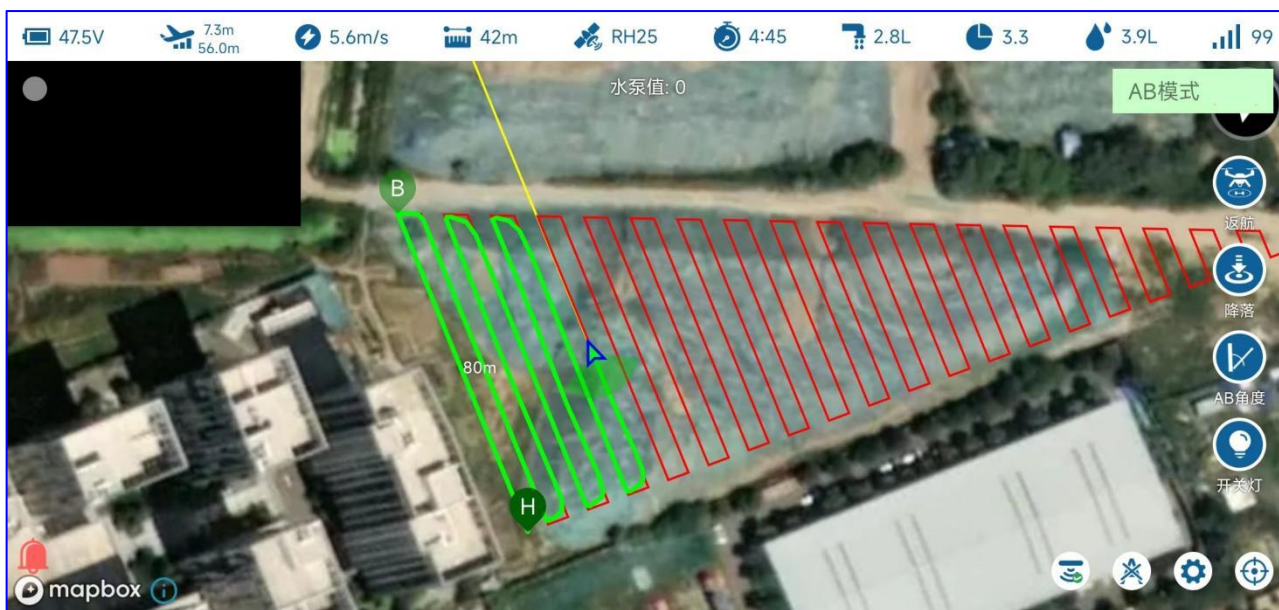
Video tutorial: https://www.bilibili.com/video/BV1yS4y1N718?spm_id_from=333.999.0.0

3.2 Autonomous route mode

3.2.1 Plot mapping

Before automatic operation, the plot boundary of the operation and the intermediate obstacle information. Click on Mapping to enter the mapping page:

Figure: Mapping plot type selection

Select the type of land to map:

Polygonal plot: map the boundary of the plot for the whole large field block, and then plan the route to operate within the plot.

Free route: for the need of irregular spraying, such as spraying irregular fruit trees, the need to stay on the tree for spraying, etc.

The APP supports mobile phone / remote control / aircraft / AIL / RTK base station / puncter / map in 6 plot mapping methods, among which the aircraft / RTK base station / puncter can support RTK high-precision dot (with RTK version optional).

The following takes the dot points as an example of how to conduct high-precision RTK plot mapping.

1) First, enter the remote control Settings page, and then connect to the Chihiro service;

Figure: opens the Chihiro service

2) Enter the adapter page, search for the adapter, and connect to the adapter Bluetooth. If the connection is successful, the positioning information of the adapter will be displayed, as shown in the figure below:

Figure: Schematic diagram of the piketer positioning

3) Return to the main interface, and then enter the surveying and mapping interface, select the polygon plot / free route, and then click the key button in the bottom right corner of the figure, select the dot device, select the corresponding dot device, click sure, the APP will automatically connect the set dot device bluetooth, successful connection after the dot device location status and location will be displayed on the map.

Figure: dot-click mode selection
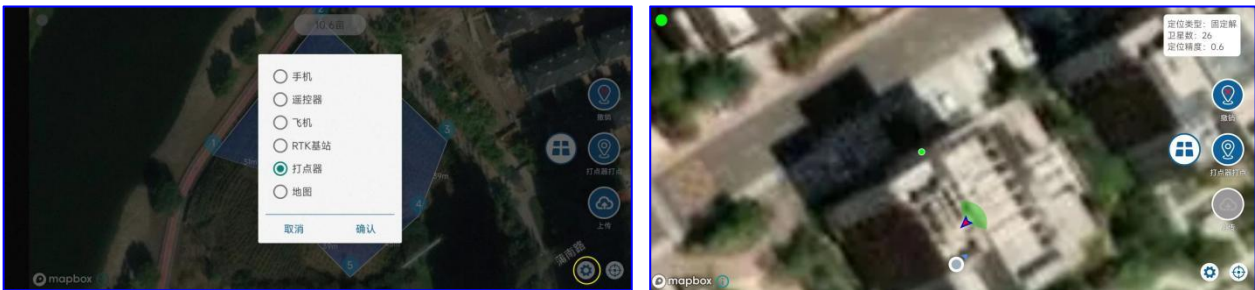
4) Point Select the ① dot type-boundary point in the yellow box.② records the point. Click ② dot at the required boundary until all boundary points are completed. When the dot location is wrong, click the cancel button to cancel the last point and redot.

Figure: Polygon plot plot

5) Sdfsd After mapping the boundary of the polygon, if necessary, obstacles can be clicked inside the polygon, and click the dot type button to enter the obstacle point mapping mode. Also click the click button to record the obstacle boundary. After the obstacle boundary record is completed, click the end obstacle button to complete the mapping of the area of the obstacle.

Figure: schematic diagram of obstacle dot switch
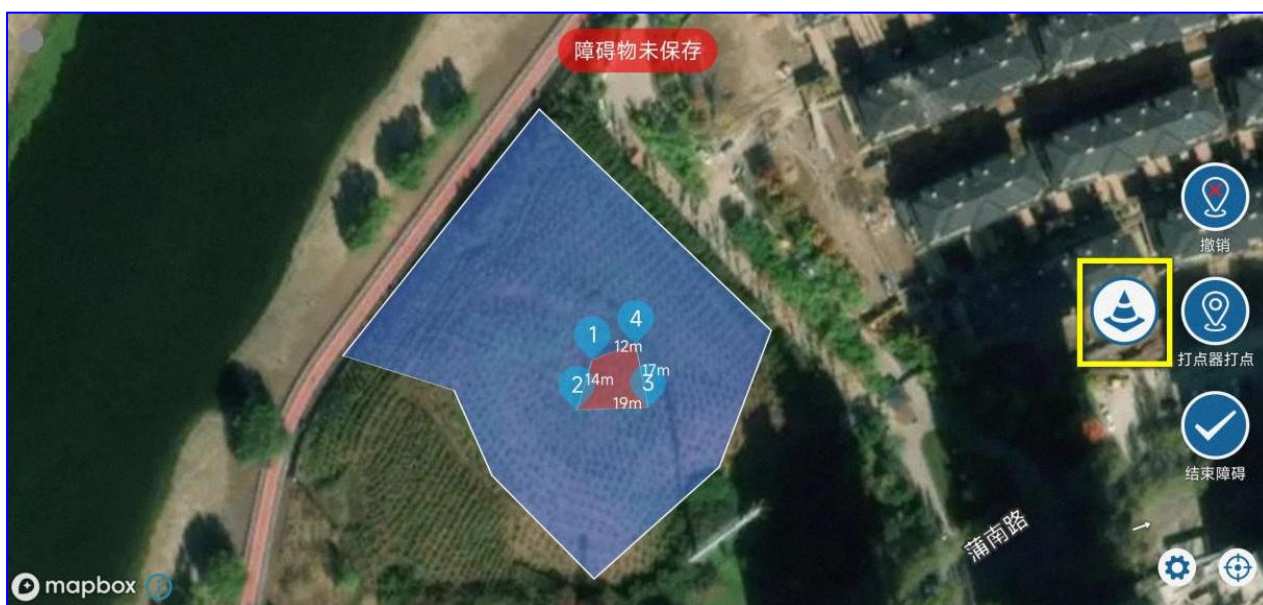
6) If you need to surveying and mapping poles / trees and circular obstacles, can continue to click on the lower dot type button to switch to the pole obstacle mapping mode, and then put the dot in the center of the obstacle, click the dot button, can automatically generate a polygon obstacle area, the lower right corner ruler icon can freely set the radius of the pole obstacle area.

Figure: Mapping diagram of bar obstacles

7）After completing all the mapping, the dot type will be switched to the boundary point, and click the upload button, the mapping plot information and obstacle information can be saved and synchronized to the plant protection network management platform for subsequent operations, as shown in the figure below.

Figure: plot upload server

So far, the surveying and mapping work is completed.

Plot planning and homework tutorial: https://www.bilibili.com/video/BV1US4y1m77f?spm_id_from=333.999.0.0

Chihiro Connection tutorial: https://www.bilibili.com/video/BV1dU4y1g7YN?spm_id_from=333.999.0.0

3.2.2 Air Route Planning

After the plot mapping is completed, it is necessary to edit the plot to generate routes. Route editing can mainly have the following attributes:

1) Route generation

➢ Entering the automatic work interface, the current account site near the location will be displayed. The APP obtains the plots from the plant protection management platform through the network. If the network is not smooth and has not been successfully obtained, it can refresh the list again after descending the plot list. Where there is no network at all, the plots will be kept locally.

➢ In the plot list, select the plot that you want to work on.You can click the next button to enter the plot planning.

Figure: plot selection

➢ After entering the plot planning interface, you can set the relevant route direction, the
edge reduction distance, the ridge distance width, the starting point position and so on.

Figure: plot planning parameter setting

➢ Select different edges (1 / 2...), and the planned route is parallel to the selected edges
(orange markers highlighted).

➢ Each edge can be set with a safe distance, which can be set by adding or subtracting
buttons, or by entering numbers directly.

➢ You can choose any vertex of the plot as the starting point of the route. Touch the plot
vertex attachment. The Navigation Point of ① is automatically planned near the vertex.

➢ If the route direction of the plot boundary does not meet the operation, any angle disk
can be used to adjust the route angle.

➢ Click the route type button to select the route type to be planned in the current plot, and
you can plan the bow route / winding route / fruit tree route / throwing route.

Bow route: plan back and forth bow route on the plot.

Around the edge: a route around the edge of the plot for sweeping the

edge

Fruit tree route: For the whole row of fruit trees, click 1 / 2 / 3 / 4 at the end

point of one side of the tree row and 5 / 6 / 7 / 8 at the end point of the

other tree row. When planning the fruit tree route, it can automatically connect 1-8,2-7,3-6,4-5 into a line and plan the flight path.

Drop routes: For drop models, a drop point can be planned every other distance.

➢ Click the intelligent mileage button to set the maximum flight mileage of a single flight. After the setting, the route will be divided when the flight route is planned, and the flight route will be completed at the flight point close to the starting point within the set maximum flight mileage is set. The drone will hover / return, and the next sorties will start the next flight from near. This function is reasonably set to ensure that the route is close to the starting point, and the next flight flies to the distance without a load.If the intelligent mileage is set to 0, turn off the intelligent planning function, as shown in the figure below:

Figure: intelligent mileage opening schematic diagram
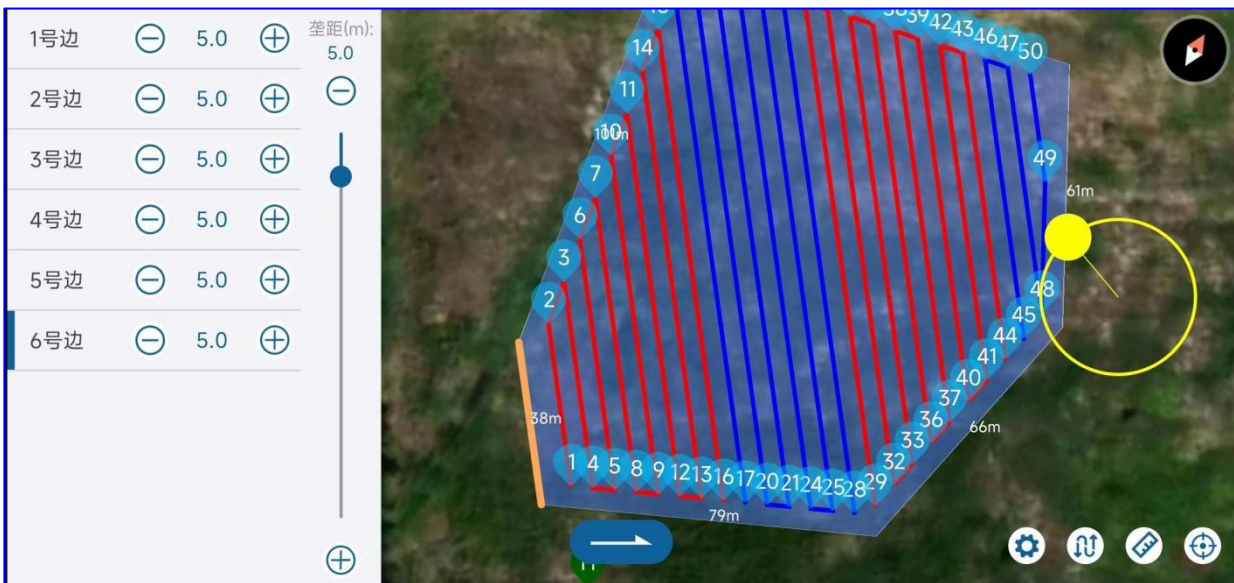
➢ Click the safe distance button to set the safety boundary distance and the obstacle boundary safety distance. The boundary safety distance indicates the in-route contraction distance, and the obstacle boundary safe distance indicates the off-route expansion distance near the obstacle.

2) Delete some navigation points

In the process of actual operation, a plot may have a few routes are work, can be

deleted by deleting the point will not work routes, specific operation is: click to delete the route serial number icon, in the pop-up prompt box input delete the end of the route serial number, and then confirm, the figure below:

Figure: A schematic diagram of the deleted navigation point
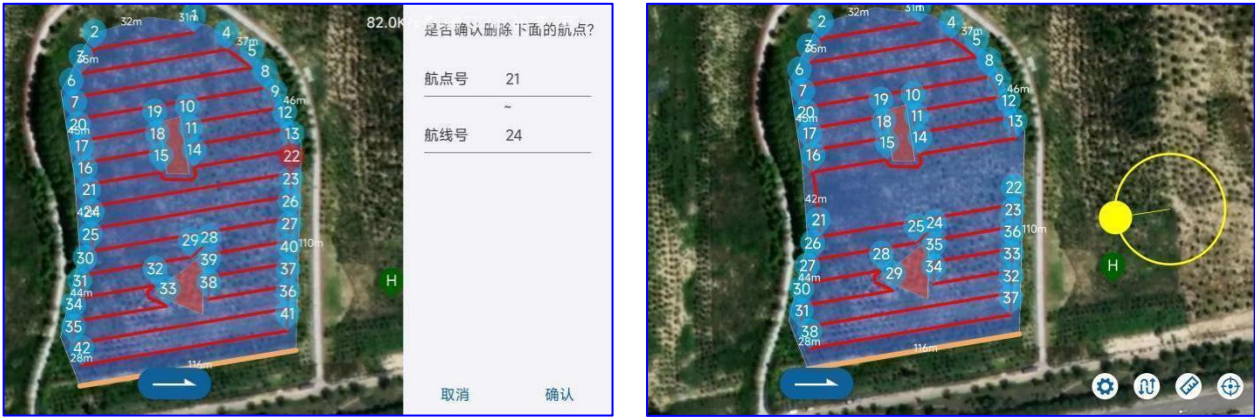
3) Set up the landing point of the auxiliary takeoff point

If there is an obstacle between the take-off point and the flight point 1, or between the take-off point and the return point, the take-off / return point can be set on the map, operation: long press on the map, the red triangle will appear on the map after 1 second, indicating that the setting of the auxiliary point has been successful. Auxiliary points need to be set up in advance, before flying to one point and before returning home. Re-upload the route or click the Clear auxiliary point button to clear the auxiliary point.

Figure: sets the auxiliary points
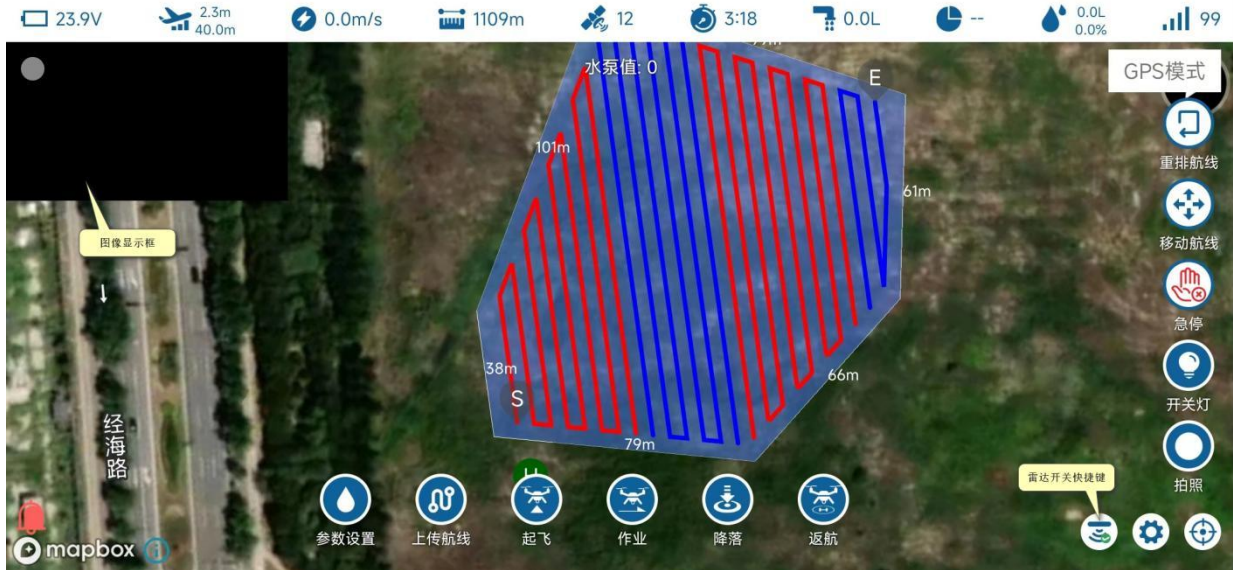
3.2.3 Autonomous flight

After the route planning is completed, click the next button ⬜➡ to finish the planning and enter the route operation interface, as in the figure shown below.

Figure: Automatic job interface

After checking that the route is normal, click on the parameter setting to set the height / speed / mu dosage of the route, and then upload it to the route (remember to upload the route before starting the operation), and then take off and wait for the uav to take off automatically. After taking off, click on the operating UAV to start operating according to the scheduled route.

Route rearrangement: For operations with a distant breakpoint, you can use the route rearrangement function. After clicking on the route rearrangement, you can replan the starting point near the drone, and then start the operation.**Remember to upload the route again after the route rearrangement.**

Figure: Schematic diagram of the air route rearrangement

Mobile route: make the overall movement of the route. If there is an overall route deviation for the plot,

the route movement can be used to adjust the route deviation.

Emergency stop: you can click on the emergency stop to suspend the route.

Switch lights: For drones equipped with lights, this button can switch the night lights.

Take photos: For drones equipped with a camera, this button can control the camera to take pictures.

Switch shortcut key: quick switch ground prevention / obstacle avoidance radar, and height control mode.

➢ The route is not completed, after the drone returns to change electricity and dressing, the operation does not need to upload the route. After the drone takes off, click the operation again, then the plane will fly to the breakpoint of the last route;

➢ Even if the obstacle avoidance radar is installed, the radar obstacle avoidance is automatically closed during the process of navigation point 1;

➢ Ridge changing mode can choose right Angle turn or U-type bend;

➢ Support for real throttle / course real adjustment and remote control operation for obstacle avoidance, please refer to chapter 3.1.4 for specific operation;

➢ Spraying amount can be set as fixed pump output or per mu dosage automatic speed mode.

➢ When the plot is not completed, you need to continue the next day, just select the current plot next time. When planning, the APP will prompt you to continue the last job / read the last plan / replan, choose to continue the last job, and you can retrieve the last job from the background and continue the last unfinished task.

Figure: continues with the last job diagram

3.2.4 Autonomous Flight- -Fruit Tree mode

Fruit tree mode is to measure the longitude, latitude and altitude of each tree (by relative altitude and altitude) of each tree into a planned route. It can set whether the route spraying, navigation point hover spraying time.Plot can also be surveyed in advance to generate usable routes and save them.cvs perhaps. Import the kml file into the APP for usage.

1）Enter the mapping interface, select the free route to start clicking, or select the import button in the upper right corner, to import the generated navigation point file.

Figure: Free Route Test Selection
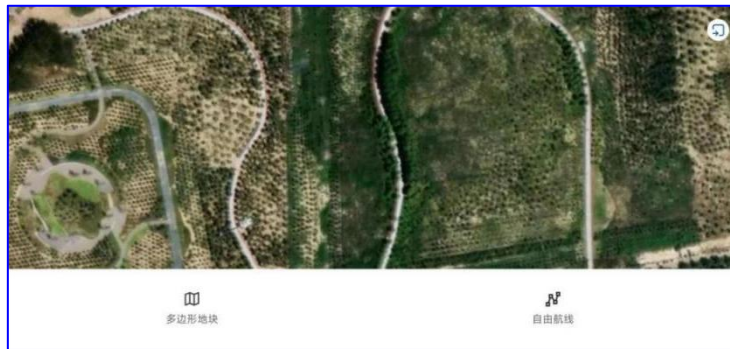
2）Beat the path to fly. The free-route drones fly along the mapping path.

3）Enter the automatic operation interface, select the mapping completed free route, set the free route spraying switch, hover time and other parameters, and after you complete the setting, upload the route, and perform the operation.

Figure: Free-course course mapping schematic diagram
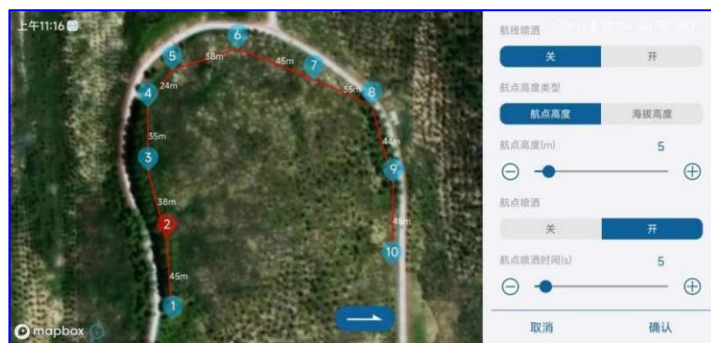
Fruit tree mode video tutorial: *https://www.bilibili.com/video/BV1M44y1V7A2?spm_id_from=333.999.0.0*

4.Instructions for the use of the APP

4.1 Account Registration

Users can set the parameters of the plant protection UAV through the agricultural service plant protection ground station software. Ground Station software is a Android app that can run on any Android phone or tablet.Download the reference 1.4 APP installation.

As shown in the figure below, the main entrance of the ground station contains six functional buttons: setting, mapping, manual operation, automatic operation, management, and mine.

Manual and automatic jobs need to be built in management or join the team.

Figure: APP main interface

There are account roles divided into three types: manufacturer, enterprise operator and individual operator.Account permission is shown in the following table:

Table-Platform role function difference table

平台角色功能差异表

账户种类 / 账户功能	实时监控	数据统计	禁飞区	型号管理	飞机管理	企业信息	员工管理	团队管理	个人信息	系统日志	公告	注册 WEB	注册 APP	设备管理	团队管理	员工管理	地块管理	地块作业管理	任务管理	订单大厅	查看数据内容
			业务管理			我的企业/我的信息					公告管理	注册		APP 管理							其他
制造商账户	√	√	√	√	√	√	√			√	√	√	√				√				生产的飞机
企业运营人账户	√	√	√		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	名下的飞机
个体运营人账户	√	√	√		√				√	√	√	√	√	√	√	√	√	√	√	√	自己的飞机

Manufacturers and enterprise operator accounts must be on the web page at http://agcloud.vk-fly. Registered com, personal operator account in the APP-> my.。

Manufacturer account: Plant protection UAV manufacturer, which can manage all the aircraft produced by the manufacturer, has senior reference authority, and the internal employee account added to the manufacturer's account also has senior reference authority.

Enterprise operator account: a plant protection company with legal plant protection qualification, an aircraft binding company, can be distributed to the company employees;

Individual operator account: individual users who purchase or use the aircraft have no advanced reference authority.

4.2 My

Figure: APP for my information

Agricultural service main interface click me to enter this interface. In my view, account information, homework, and agricultural service version information.

Operation mu number: the sum of the current account number;

Flight sorties: the total flight sorties of the current account number;

Job time: the total job time of the current account;

Warning message: The user operation error will be given here, and the manufacturer and operator of the aircraft can see the warning information of all the aircraft with the relevant authority. For example, invade the no-fly zone.

Announcement information: users know the latest platform and ground station information view place, such as updated information will be prompted here, whether manufacturers, operators or individual people need to pay attention to the announcement at any time.

Figure: my personal information Figure my settings

Click the ② in my information of the figure APP to enter the operation details interface: you can view all the operation tracks, acres, etc., short press a certain sorties can enter the flight record details page, long press the screen can select more than N sorties data to display on the map, you can also choose the daily newspaper or the operation track for a period of time.

Figure: My Flight record details

Figure: daily
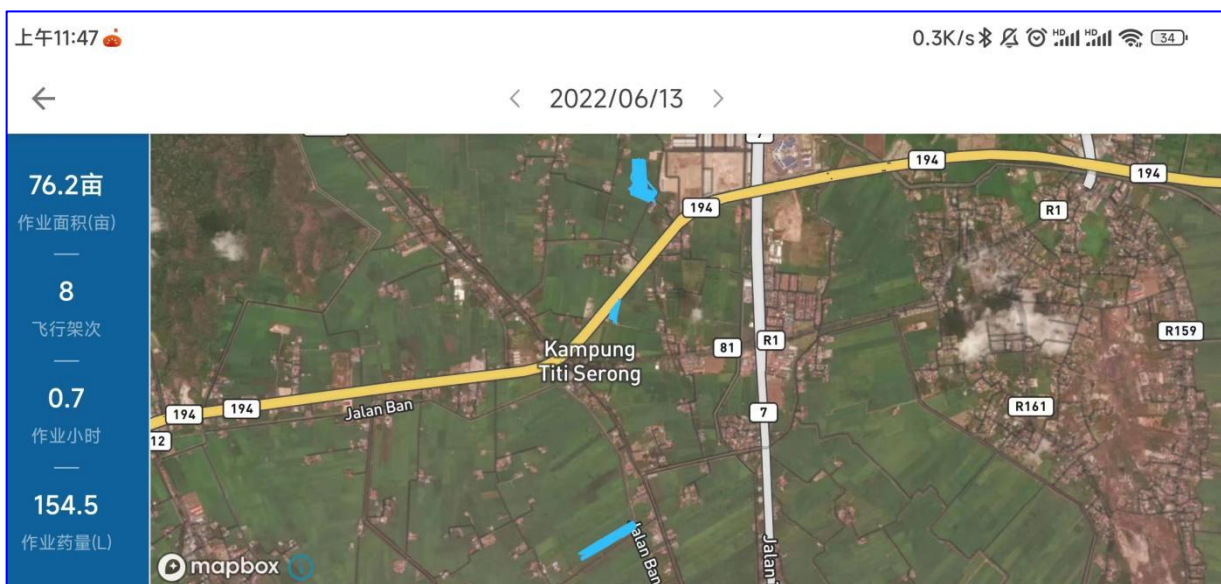
4.3 Management

The content contained in different management is different.*Management includes: equipment management, team management, staff management, plot management, plot operation records, operation statistics.*

Figure: management

4.3.1 Equipment management

Click on equipment Management, you can see all the aircraft of the user, as shown in the figure of equipment management, the statistics at the top of the page: operation mu, flight sorties, operation hours, these statistics are calculated by these aircraft from the date of registration in this account.

For a new aircraft, the activation date is the registration date. For used aircraft, the time of transfer to this account is the date of registration.

If the user has equipment management authority, you can see all the aircraft under this account, and if you have no equipment management authority, you can see only the aircraft that the manufacturer has assigned to the user.

Figure: Equipment Management

The device management list can display all the drone numbers activated for this account, and click the device number to enter the basic details of the aircraft.

Figure: basic details of the device

Name: Where the name can be modified;

Allocation fly hand: If the user has the equipment management authority, he can assign the selected aircraft to the subordinate staff and the administrator where the user is a team who can assign the selected aircraft to the subordinate team members;

Aircraft status: offline, locked, online, operation 4 states;

       Offline: the drone is not powered up;

       Online: UAV drone is not fly;

       Operation: the UAV is in the flight operation;

       Locking: The UAV is locked by the manufacturer / operator, and the locked UAV cannot take off;

Transfer: Aircraft can be transferred between the operator accounts. Click on the transfer at the bottom of the picture, and then scan the QR code of the transferred operator's account to transfer the plane to the other party.

Flight record: You can see the operation record of the current numbered drone, and you can also screen the data you need according to the time, team, (members of the selected team) to display the data you need.

Figure: Equipment Flight Record

Select the flight record in the list, enter the flight record details interface, you can replay the flight track and replay the state of the aircraft in flight.

1) Device activation

The newly opened equipment needs to be activated before use. The UAV is connected to the agricultural service APP, enters the management-equipment management interface, and the current connected UAV number will be displayed.After activation, this number UAV and belongs to the current activated account. The current activated account can see all the flight data and manage the UAV.

Figure: device activation

Click the aircraft number, click to confirm to activate, the activated aircraft with which operator account activation belongs to the operator account.

2) Device locking and unlock

For the aircraft under the account permission, you can remotely lock or unlock the aircraft by clicking the lock / unlock button in the basic details. Note that after the aircraft is locked, even when the power is on.

Figure: Schematic diagram of the remote locking / unlocking of the device

3) Equipment transfer

Click on the transfer of the basic details, the transfer prompt box will pop up, click to confirm will enter the state of scanning the QR code, as long as you scan the QR code of the account of the operator to be transferred to transfer the plane to the other party.

Figure: Schematic diagram of equipment transfer

4.3.2 Team management

In order to better manage the plant protection service team and optimize the data statistics in more detail, we have established the team management mode.All plots in the team are shared, and job data can be shared.Entering the team management interface, you can build your own team in the creation team at the bottom of the chart, as shown in the figure below;

The role of the operator account in flight 3 team is the administrator and captain in the team, and the operator account in the mountain team is the role established by other administrators.

Figure: team management
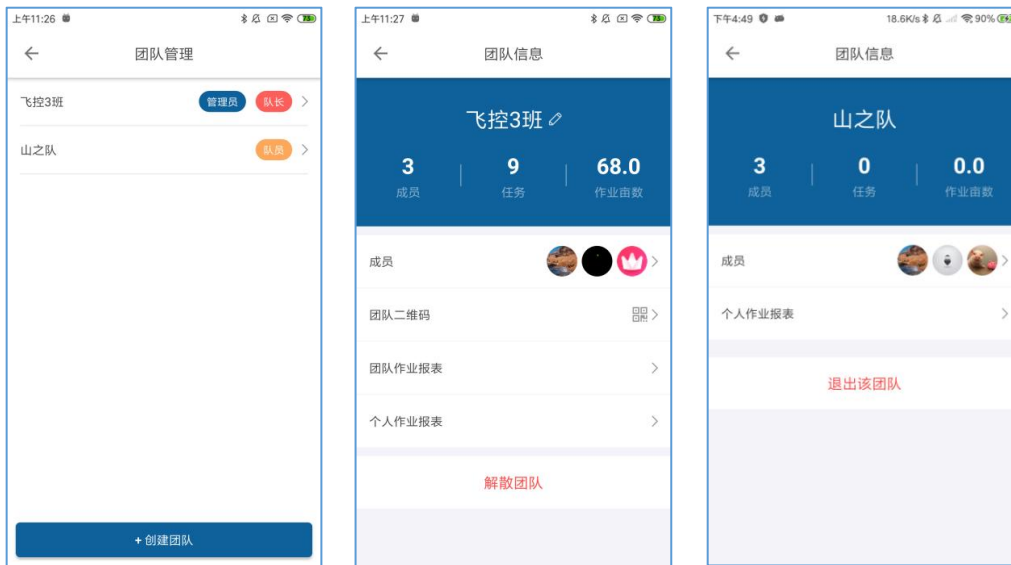
Click the team in the list to enter the team information page. In Figure 12, the operator account is the team leader, and the members at the top of the page belong to the total data of the working mu of the team.

Flight control Class 3: This is the team name;

Members: Check the composition of the team members, the contact phone number and joining time of each member.The team captain can transfer and delete the team members.For example, because the operator account is the team leader, the operator account can be transferred to any team member of the team as the team captain at any time, or any team member of the team can be deleted.

Team QR code: you can let other registered APP natural person can scan the code to join the team;

Team operation report: operation acres, flight sorties, operation hours are the comprehensive team data; the data in the list is the detailed data of all the single flight sorties of the team members.

Personal operation report: operation mu, flight sorties, operation hours are personal data; the data in the list is the detailed data of a single individual flight sorties.

Members of the team can only see the total team data and member and personal work reports.

4.3.3 Employee management

The manufacturer account and the enterprise operator account have the employee management authority, and you can manually add the employee account within the company.Go to the Employee Management page.

Employee: The operator's account is the staff who already has an account under the company. Members of the team can be employees or non-registered APP natural persons of the company.Enterprise operator account can add employees.

Name: Name of the employee;

Login account number: the employee's mobile phone number;

Account number is enabled: after opening, the input employee mobile phone number will receive the verification code. Employees can log in to the APP through the SMS verification code, and then change the password in the setting in the upper right corner of "My".

In addition, employees can also add an account to the employee management on the platform to directly set the account password for employees, and allow employees to log in to the APP by entering the account password.

Click the employee in the employee list to enter the editing employee information interface, and you can re-edit the name, login account, account enabled and personnel position.

Permission size: Enterprise Administrator> Business Administrator> General employee.

Figure: employee management
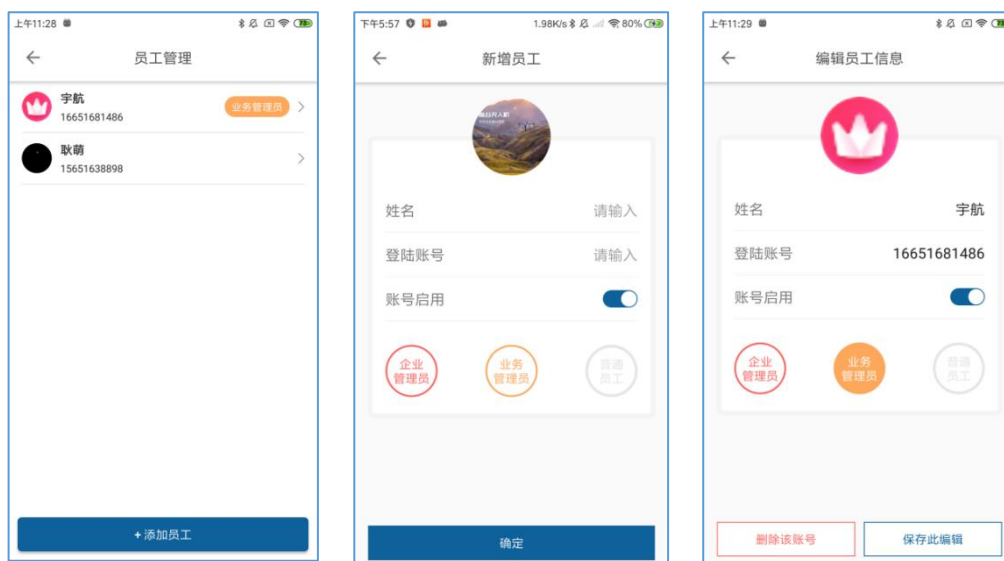
4.3.4 Plot management

Mapped plots can be seen in the plot management. When the plots need to be modified, enter the management-> plot management, as shown in the figure below.The plots in the plot list include, personal mapping plots, plots shared by other members of the team, and plots shared by other employees of the operator company.

Map plot management

Select one of the plots to access the plot details:

Figure: plot details

The plot can be modified; deleted; share; cut.

Modification: Plot shape can be modified and calibration points and obstacles can be added.

Delete: Delete the parcel information.

Share: Share the plots with another account.

Cutting: Cut the current plot arbitrarily and divide it into multiple small plots.

4.3.5 Plot operation record

The historical job record of the current plot can be viewed in the plot job record.Click the plot operation information in the plot operation record list to enter the plot operation details page; the plot area above the map, the operation, operation progress, operation status, drug dosage are the integration of all data in this land,

Plot details: enter the plot details page;

Flight records: Records of flight sorties entering this land;

Related to the task: Associate the records of this land to the task, and the "task" is a list task in the task management (see the operator account Task Management for details);

Also: In the plot job record list, a plot in the 2-second list is quickly linked to the task.

Filtering: You can filter your required parcel job records using start time to end time or

selecting a team.

Figure: plot job details

4.3.6 Task Management

Click on to enter the task management page, click on the new task to create a new task;

Start time: Time to start the task (give sufficient preparation time);

Task name: You can edit it as needed;

Location: Select the scope of provinces and municipalities;

Details: Detailed and specific location information below the area;

Estimated area: fill in the estimated area according to the actual situation;

Crop types: optional wheat, rice, corn and other crops and cash crops, selected according to the actual situation;

Operation type: according to the actual purpose of insecticide, weeding, fertilization, sterilization, other.

Click the built task in the task list in the figure to view the task details; the top estimated area, work, work progress, work land, drug dosage belongs to the total data of this task;

Assign a team: the operator can change the operation team at any time according to the actual situation;

Add plots: Add task-related plots together for unified management;

Add a regulatory account: increase the personnel who can be supervised, but can only see and can not change;

Job record list: Job record list of all plots for this task;

Sortie report: record of flight sorties of all plots of the mission;

Modify the task: modify the task;

Task completion: Finish all plots in the task, this task will not be changed;

Copy task: easy users to publish the same task information directly during the following rounds of application.

Figure: Task Management Schematic Drawing
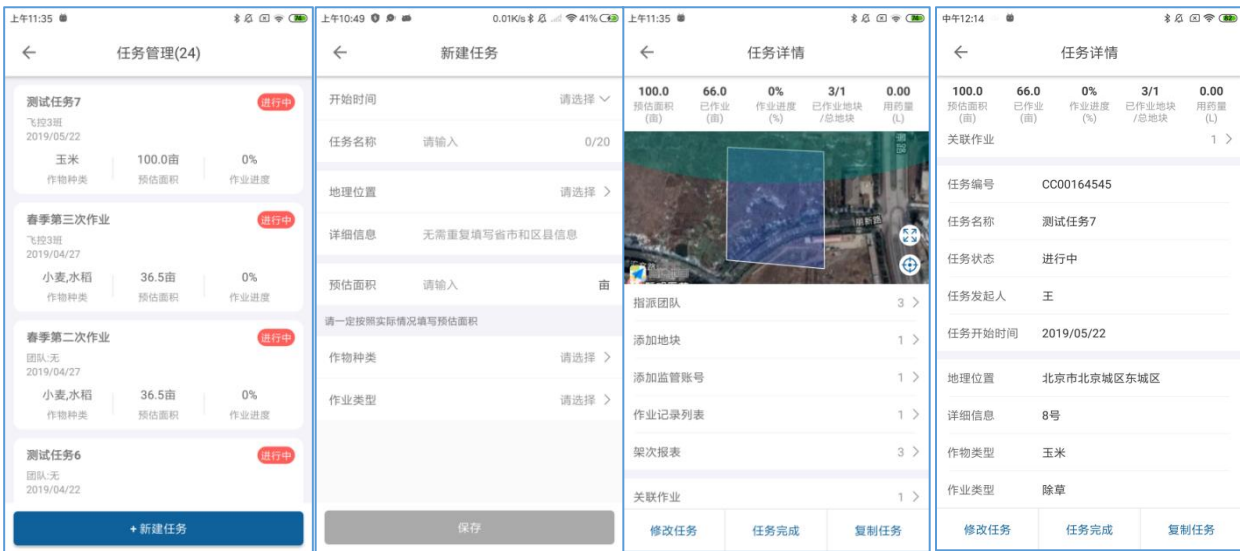
4.3.7 Order Hall

Click the order hall to enter the order hall list, as shown in Figure 32;

The newly released orders are divided into two kinds, the first is free to grab order, which becomes "grab order" in Figure 32; the second is confirmed by Party A (land owner), in Figure 32, "I want to grab order (Party A chooses)"; in Figure 32, Party A agrees to change in Figure 25. Before grabbing the order, you can click on the order and enter the order details, as shown in Figure 33-34. After grabbing the order, you can see the relevant details in the task management.

Also: The country in the upper left corner of Figure 32: You can quickly find the order

information you need by choosing an area;

Screening: You can screen your required order information based on the unit price, area, time, and distance (as measured by the handheld ground station APP range).

Figure: Schematic diagram of the order hall
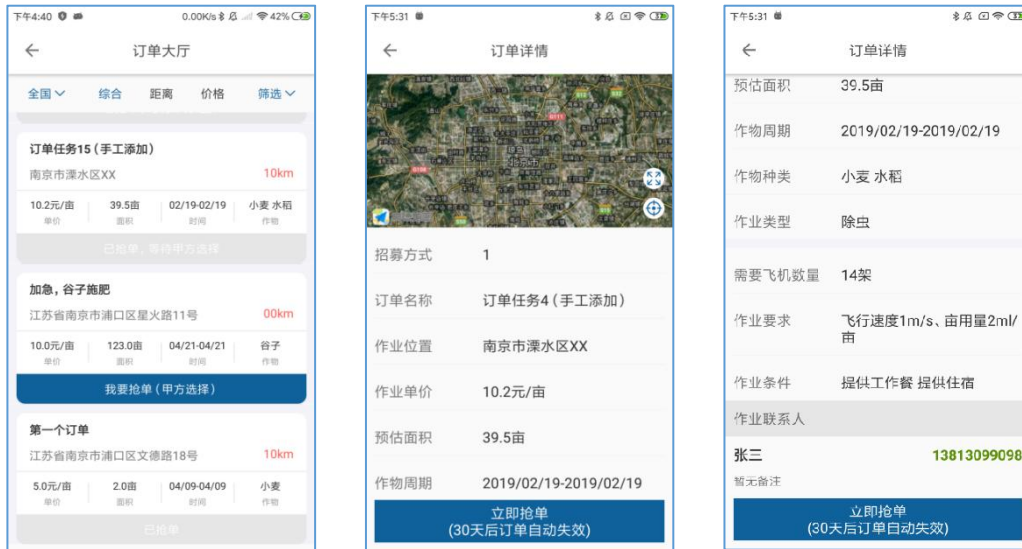
4.4 APP settings item details

Settings functions include configuration and UAV remote control setting, plant protection setting, remote control channel inspection, motor inspection, flight calibration and reading of the flight log and other functions.

4.4.1. Remote control settings

Figure: Remote control setup page

The Bluetooth connection mode and the USB connection mode are currently supported.

In Bluetooth connection mode, search the remote control, click the remote control code and connect successfully, there will be the operation mode selection, select the Japanese hand / American hand above, select the remote control will send a "drop", indicating that the setting is successful, the upper right corner is the name of the remote control that you are connected to.

In USB connection mode, directly use the USB cable (connected with the connection line of the remote control).

Channel detection

Figure: channel check page

Channel detection is used to test whether the remote is connected to the drone and to determine whether the remote is working properly. When the user dials the switch and shakes the rocker on the remote control, the corresponding channel will see a change on the ground station.

The corresponding display data of the channel is as follows:

1. Channel 1234: the green line is at position 150; maximum value 1200, minimum value 100; channel 2 is the reverse channel;

2. Channel 5: If in manual stabilization mode (GPS mode), it should be 150; if in attitude mode, it should be 110; AB point mode, it should be 190, with three values of 110,150 and 190;

3. Channel 678:110 at the default bit on standby; the three-section values are 110,150

and 190 respectively;

Motor inspection

Figure: motor inspection page
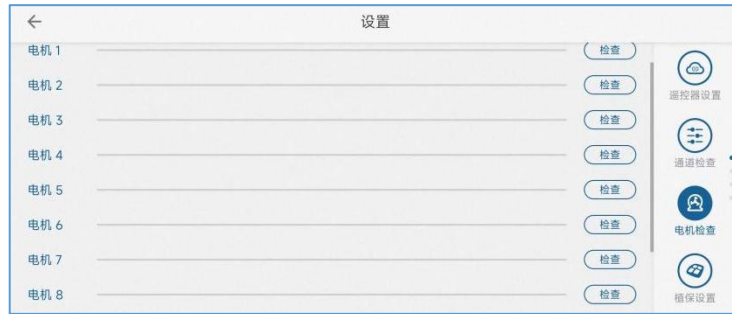
Motor inspection is used to check whether the UAV motor is working normally (the oil-moving direct drive does not have the motor inspection function).Click the corresponding check button of each motor, and the electric opportunity of the UAV will rotate, and the rotation speed of the motor will be displayed on the progress bar to judge the working condition of the motor. Up to 8 motors can be inspected.

The following points should be checked during the inspection:

1. Steering of motor, single-number motor is counterclockwise; double-number motor is clockwise.

2. Motor speed, observe whether the speed of the motor is consistent.

Plant protection setting

Figure: Plant Protection Settings page
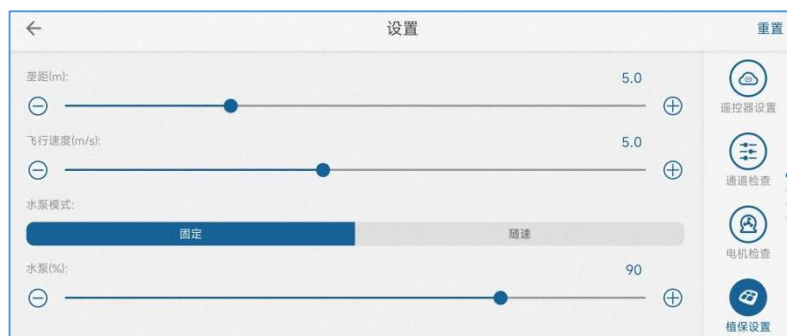
In the plant protection setting, the user can adjust the ridge distance (AB route spacing),

flight speed (maximum speed), and set the spray flow in two ways (select the working power percentage of the motor of the water pump when fixed from 0-100; select the dosage per mu at the maximum speed).

Users can adjust the parameters by dragging and dropping the slider bar, or by clicking to add or subtract them. There are many places on the ground station that can be set by these two operation methods.

Flight Settings

Figure: Remote control setup page

In Flight Settings, the user can set up:

Automatic takeoff altitude: the altitude that the aircraft wants to reach in automatic takeoff mode

Return height: the lowest altitude of the aircraft in the automatic return to one-key return mode. The current aircraft rises first if it is below this altitude, and if it returns directly and then drops.

Voltage alarm threshold and protection measures: set a reasonable voltage alarm threshold, when the voltage is below this threshold, the corresponding voltage protection

action will be triggered. The oil / hybrid aircraft will also have two-stage oil alarm setting and protection action.

Manual control direction: the nose pointing can be manually changed in the route. The default open.

Manual control height: the height can be adjusted manually adjusted at any time in the route. Default controllable.

Ground defense radar sensitivity: Using this sensitivity under ground defense, increase sensitivity the aircraft is more responsive when encountering terrain fluctuations.

Maximum speed: the maximum speed for manual flight in GPS mode.

Barricavoidance action: you can choose to hover / detour when obstacle avoidance is opened.

Fencing radius / height: The aircraft can fly in the park at the center of the circle and the radius of the fence, which will alarm and return home. With the takeoff point ground is 0, the upward can not exceed the height of the fence, after exceeding the return will be triggered.

Drug off protection: the drug off protection is triggered when the amount of Chinese medicine is low, and can be suspended / returned

Remote control protection: Remote control control will trigger corresponding protection during manual flight, and automatic route operation.

Ground station runaway protection: in the automatic operation mode, if the ground station link fails, the corresponding protection action will be triggered

Operation completion action: this action is triggered after the route operation to hover / return

Barricavoidance distance: encountering obstacles in flight, corresponding obstacle avoidance actions will be executed to hover / detour after entering the obstacle avoidance distance

Type of turn: The right-angle turn takes the longest time and turns smoothly. U turns take minimal time, fast turns, and large turn angles. The regular turn is located in between.

Flight calibration

Figure: flight calibration page

The main contents of the flight calibration page are battery calibration, geomagnetic calibration, horizontal calibration, and magnetic bias angle calibration.

1）Battery calibration: when the battery display is wrong, this function can be used to adjust the voltage, let the voltage recovery correct display; the calibration voltage for the battery in the battery manufacturer software or the voltage displayed by the measurement appliance, and then click on the calibration, the power in the debugging and flight page will become the calibration voltage.

2）Geomagnetic calibration: see the flying hand operation manual for details;

3）Magnetic deflection angle calibration: In the case of magnetic interference, after the geomagnetic calibration, it also needs to see whether the plane will fly in AB point mode or full autonomous mode, adjust the Angle according to the situation, and let the plane fly forward in a straight line.

daily record

Figure: log page
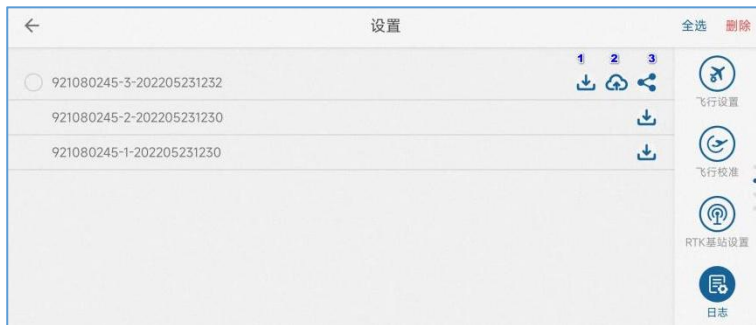
The log page is used to read the flight log on the drone and help drone developers better identify problems with the drone.*Note: The log must be read only when the drone is parked on the ground and the propeller is locked to avoid danger.*

The log list will show all the log files stored in the flight control. Look at the file name. The first part is the flight control number, the second part is the sortie number, and the third part is the log file time.

The first button behind each log is the download button, which can read the log from the flight control to the APP locally. When the read is finished, two more buttons will be published. The upload button is: upload the log to the cloud server, and the manufacturer can obtain the log files from the cloud platform. Share button: It can be sent to others through social software such as wechat / QQ.

After selecting the log, press the Delete Log button in the lower right corner.

Version information

Figure: version information page

Version information is used to display the ground station version, fly control firmware version, serial number and other information. You can also check for updates, upgrades to ground station software and flight control firmware here.

After the aircraft power supply is connected, open the APP and connect the remote control, it will automatically prompt whether there is no update. If there is an update, the user can click to the version information page to check, download the latest version of firmware and then directly upgrade and install, unplug the aircraft battery, then reconnect the plane, and then update other firmware after restart.

shakedown test

Figure: debugging page
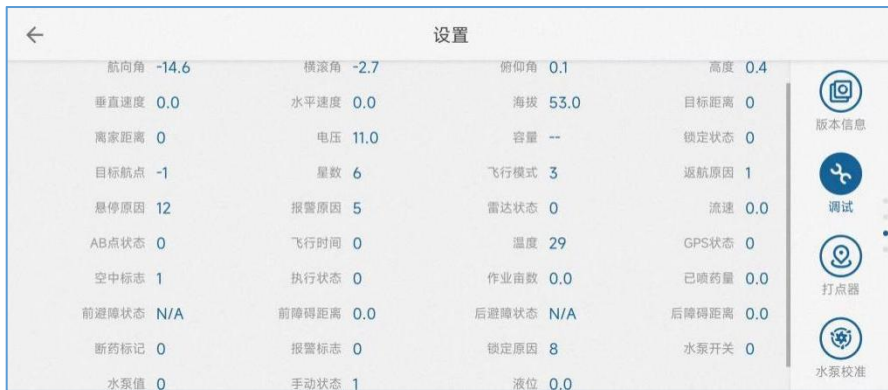
The debugging page displays some flight control information in more detail.

Point setting

Turn on Bluetooth and connect Bluetooth. If the connection is successful, the location information of the spoter will be displayed, as shown in the figure below:

Figure: DkSettings

Pump calibration

Figure: Water pump calibration page

For flight control calibration, the medicine cabinet capacity and flow meter coefficient, which should be re-calibrated after replacing the water pump or flow meter.

Water tank capacity: the actual water tank capacity size.

Coactor: Factor of flowmeter, default 21.9.

1) Flow meter calibration

Fill the medicine cabinet with water, such as at 10L, and fill the tank accurately to 10L. Enter the water pump calibration page, the medicine cabinet capacity to fill in 10, the coefficient to fill in 0, and then click the calibration flow meter, then the water pump will

automatically work to spray water, until the water tank after spraying, wait for the water pump to automatically close, to complete the calibration of the flow meter.

Intelligent battery

When using a smart battery matching with the flight control, the smart battery related information is displayed, as shown in the figure.

Figure: smart battery page

Oil and electricity engine

Oil-electric engines are also hidden, and are only displayed when using gas-electric drones, providing data status.

Type of workmachine

It can be configured with the current aircraft pressure nozzle or centrifugal nozzle, single water pump or double water pump.

Figure: workmachine type page

Other settings

In other Settings, map setting and voice prompt can be selected according to user needs; video display is only available to users with optional camera.

Also: map type: domestic mapbox; for foreign users and mobile phone open Google map when the foreign flight switch Google map.

Figure: Other Settings page
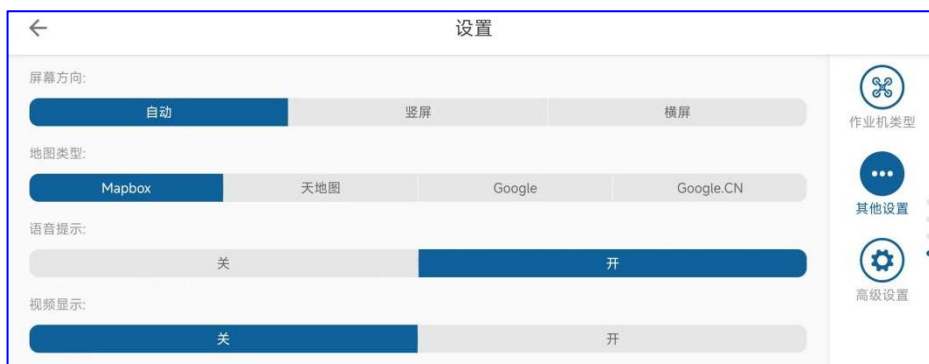
advanced setup

Note: Advanced settings options are only available when the manufacturer account logs in to the APP.

1) Model setting

Figure: Advanced Settings-Model Settings

Set the aircraft type matching the aircraft, note the motor steering and motor number definition.

2) Algorithmic parameters

Figure: Advanced Settings- -Algorithm parameters
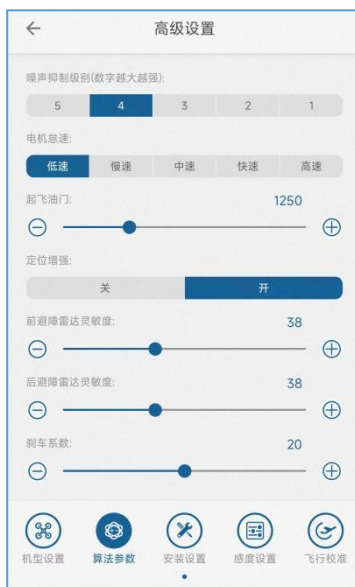
Noise suppression: inhibit the vibration of the aircraft body, the greater the vibration, the higher the value needs to be set. This option needs to match the aircraft vibration situation. The selection basis is to try to change only this parameter under the basic

flight parameter, and to select an appropriate level based on the flying body.

Motor idle: Set the minimum idle PWM value of the unlocked motor. This value allows the propeller to rotate normally but without pulling up the plane.

Take-off throttle: Invalid

Positioning the enhancement,: open by default

Front and rear obstacle avoidance sensitivity: the sensitivity setting of obstacle avoidance radar is used to adjust the sensitivity of obstacle avoidance recognition. The stronger the sensitivity, the approximate sensitivity, but also increases the probability of false positives. Generally set up to about 40's.

Brake coefficient: adjust the sensitivity of the brake, the smaller the sensitivity, the softer the brake. Default 20

3) Installation Settings

Figure: Advanced Settings-Installation Settings
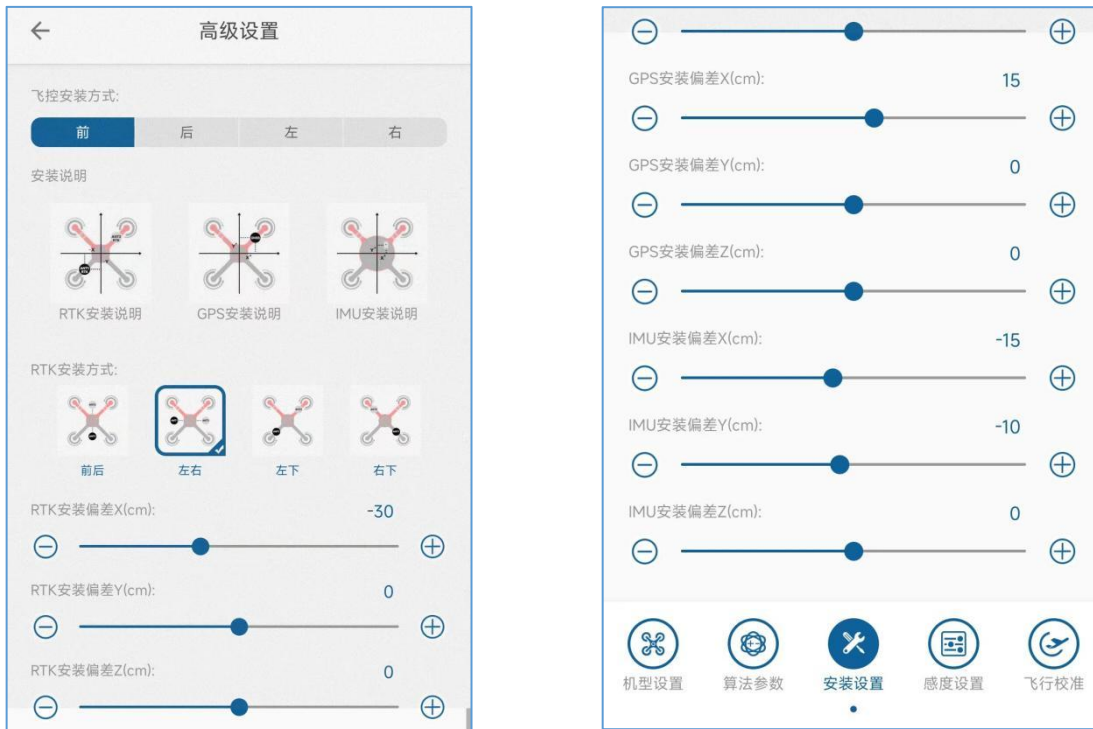
Installation direction: set the installation direction of flight control, subject to the flight control arrow

RTK installation direction: Set the installation direction of two RTK antennas according

to the actual situation, front / left / right / bottom left / bottom right. Single-antenna RTK setup is not required.

Set RTK / GPS / IMU installation error: deviation from the center of the aircraft without the Z axis.(RTK refers to the RTK antenna 1.)

4) Sensory setting

5) Flight calibration

Figure: Advanced Settings-Flight Calibration

Horizontal calibration: when the flight control level deviation, do a horizontal calibration, generally the flight control factory calibration, the customer does not need to calibration.

GPSA / B Settings: Change the GPS primary / secondary for the dual GPS version.

Positioning type: positioning device type, select according to the actual use of equipment

Battery type: Battery type, selected according to the actual battery use

Restore the factory settings: with 5 consecutive clicks, all parameters in the flight control will be restored to the default.

5.Use instructions of plant Protection Cloud platform

5.1 User Registration

The data management platform has the following user rights:

▪ Manufacturer: If it is a complete machine manufacturer, then register the manufacturer's account, and input the production equipment number into your own account name. No matter where the device is sold in the future, the manufacturer's account has the right to monitor the device. A company can only have one manufacturer super management account.

▪ Enterprise operator: The supervisor or the person in charge of the enterprise operation is the registered operator. The account can provide the operators with rich and convenient operation data management and statistics, and include the management of land parcels.

The steps for registering an account are as follows:

1） First login at http://agcloud.vk-fly. Click on the com to register, as shown in the red box below:

Figure: Registration interface of plant protection data management platform

2) Fill in the registration information truthfully according to your own needs in the registration interface, and then submit it to complete the registration.Wait for the review of the platform maintenance personnel.

Figure: registration details

5.2 Function introduction

The following example describes the functions of the plant protection data management system.

5.2.1 Main body interface

Figure: the main interface of plant Protection Cloud platform
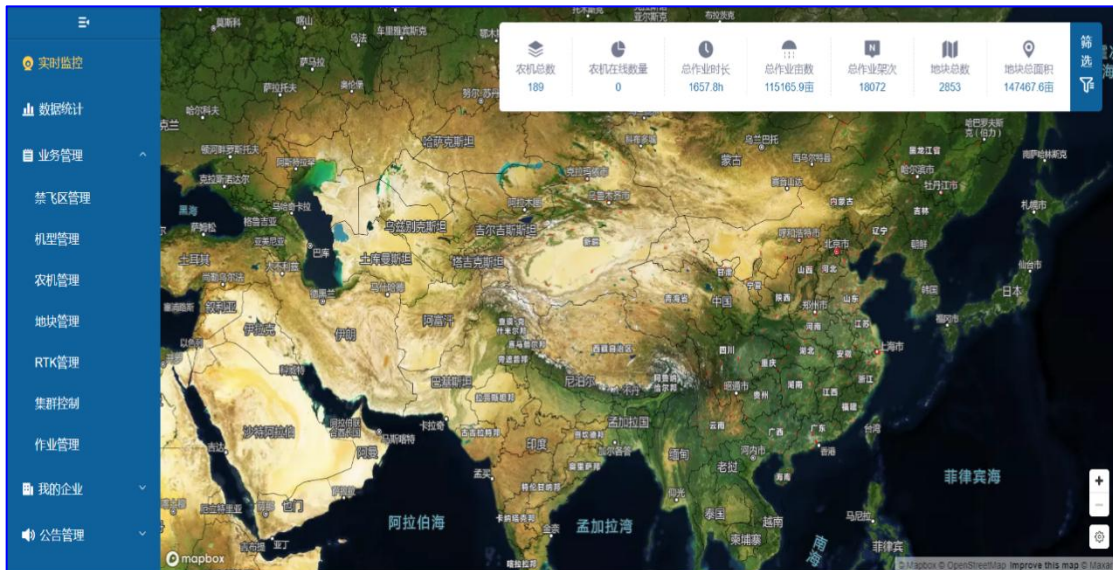
- Real-time monitoring: real-time real-time online operation monitoring of all operation equipment under the account on the map;

- Data statistics: job statistics, has been shown;

- No-fly zone management: at present, the no-fly zone function is only used for query, and does not have the function of background planning no-fly zone;

- Model management: Users can add all the models of the company;

- Agricultural machinery management: display the I D index of all agricultural machinery manufactured by the company;

- Land management: display the land measured by the account number and measured by all employees of the Company;

- RTK management: can see the purchased equipment and Chihiro's I D and expiration time (function to be improved);

- *Cluster control: temporarily closed;*

- *Job management: no implementation function;*

- Employee management: our employees can be added and deleted, and the employee account can also monitor the operation of our equipment, but it does not have the editing function;

5.2.2 Real-time monitoring

Real-time monitoring interface of the map cloud platform
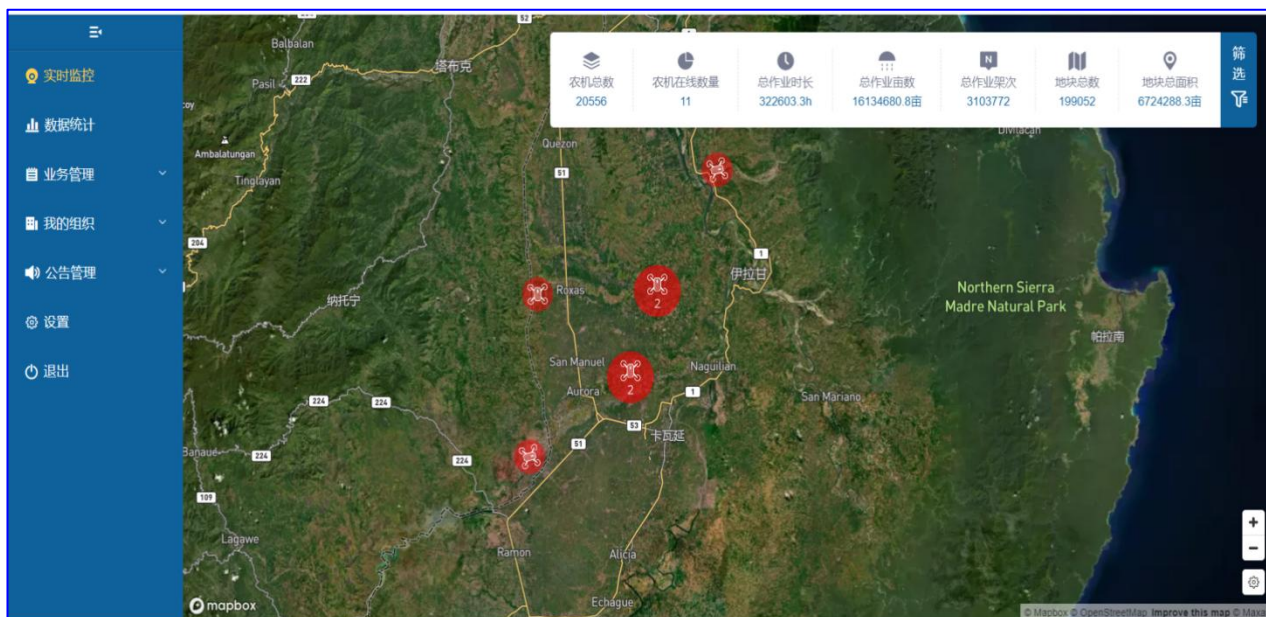
The real-time monitoring interface shows the position of all agricultural machinery and equipment in the company's current online operation on the map, and shows the number of agricultural machinery, online agricultural machinery, total operation time, total operation mu and other information in the display bar above the account.

Users can view all the operation information of the farm machinery by amplifying the map and then clicking on the farm machinery icon, as shown in the figure below:

Figure: Agricultural machinery details diagram
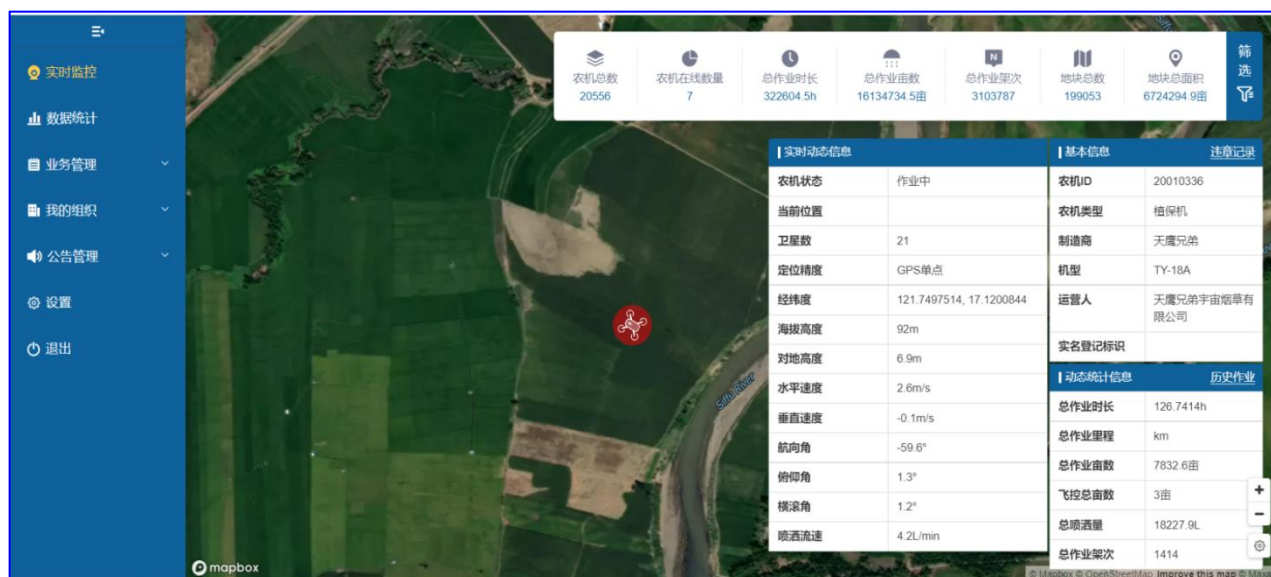
By clicking the historical operation in the figure above, you can view all the past operation movements of the agricultural machinery, as shown in the figure below:

Figure: detailed operation sorties information of agricultural machinery
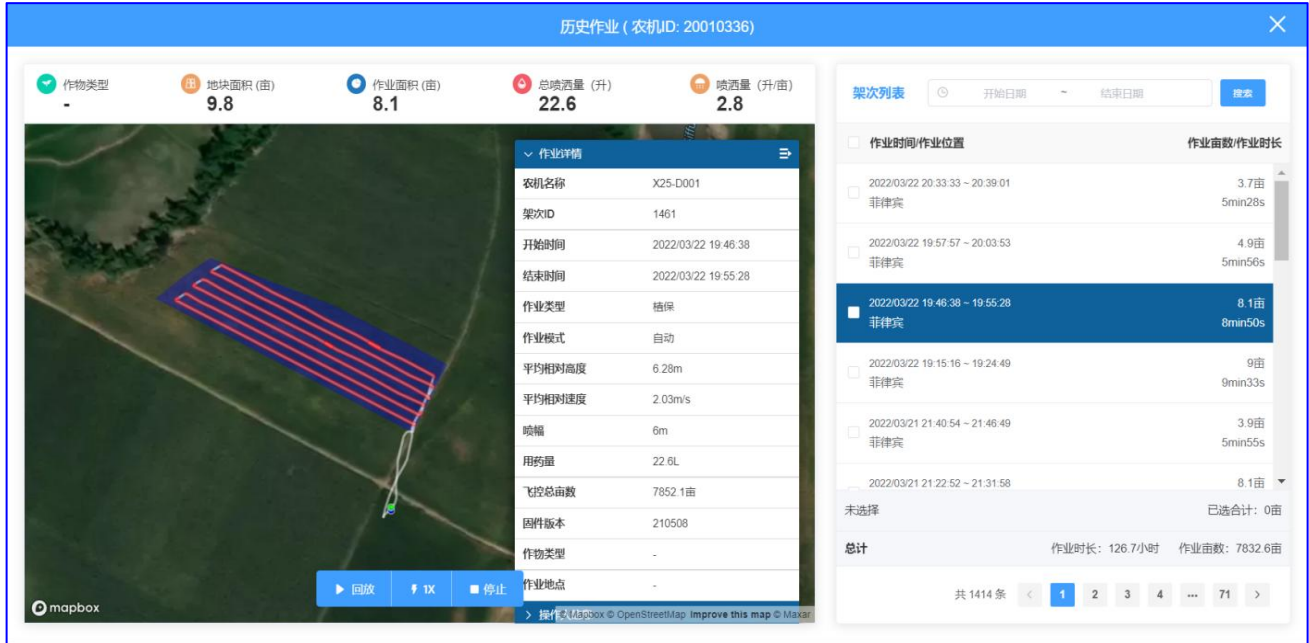
Select the operation sorties catalog on the right, and you can view the operation information of each sorties, including the operator, flight speed, altitude, operation track, operation mu, spraying dosage and other information.

5.2.3 Data statistics

The Data statistics function provides the statistical function according to the different latitude of the model, account number and region, and can export the CVS data statistics table.

For example, if you would like to count the operation information of all agricultural machinery under the company account from March 1,2022 to March 20,2022, it can be realized according to the following steps.

1）Click to Start statistics in the data statistics interface.

Figure: Cloud Platform Job Statistics-1

2）Select the start and end time of the statistics, and the other options default directly, indicating that this item is not a constraint

Figure: Cloud Platform Job Statistics-2

3) Click the next step, you can choose the attributes of the X axis and the Y axis according to different dimensions. Generally, the X axis chooses the date, while the Y axis can choose the number of operation mu, operation sorties, spraying dosage and other latitude. This example chooses the number of operation mu.

Comparison dimensions select agricultural machinery, and other dimensions select default values, as shown in the Figure: below.

Figure: Cloud Platform Job Statistics-3

3) Click the display to reach the following statistical chart, that is, according to the daily statistics of each operation mu of aircraft

Number, which supports exporting the statistical results to the C SV files.

Figure: Cloud Platform Job Statistics-4
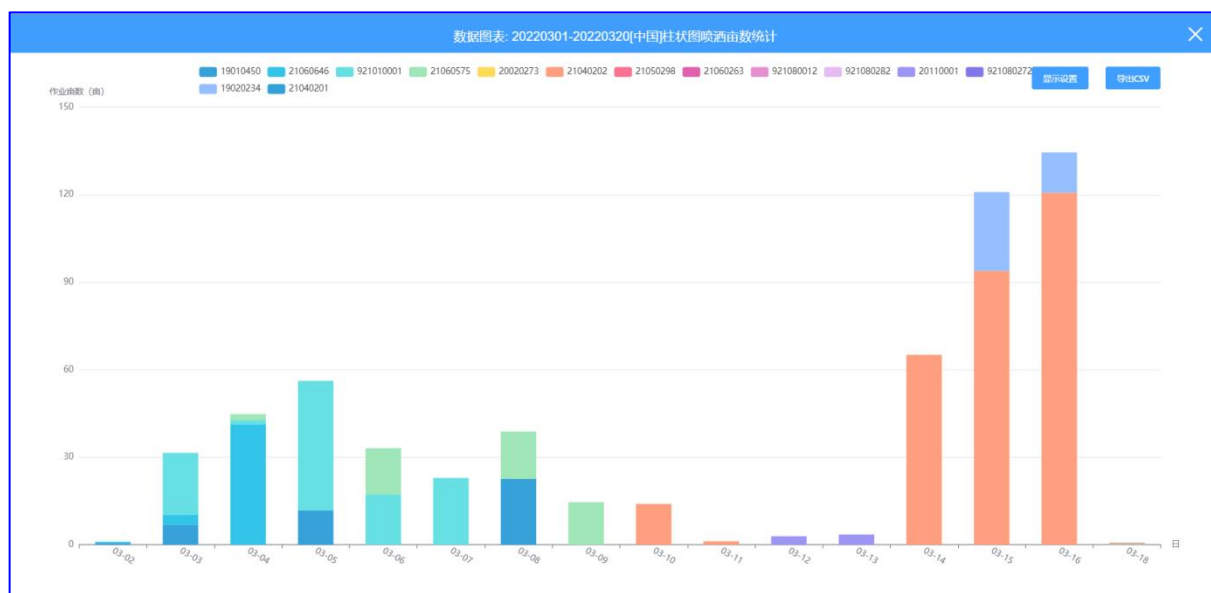
5.2.4 Model management

Users can add the company's model information in this interface, add a single model, fill in the model information, and confirm that it can be added successfully.

Figure: shows a schematic diagram of the added model
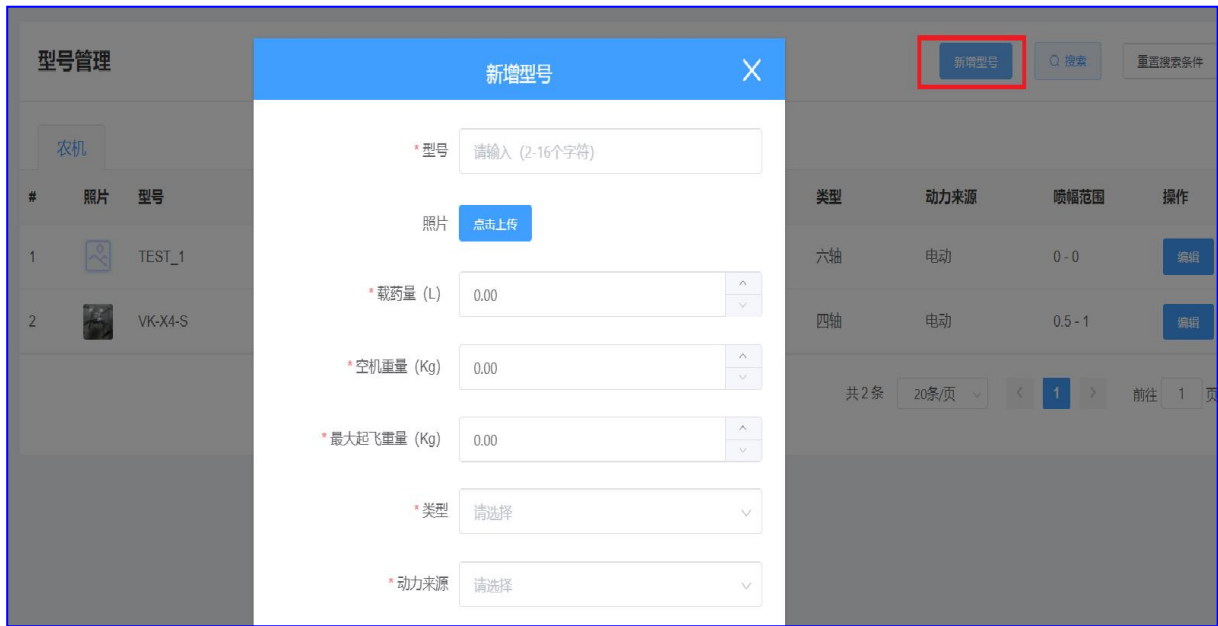
5.2.5 Agricultural machinery management

The agricultural machinery management interface will list the I D of all the agricultural machinery manufactured by the company, as well as the current operator of the agricultural machinery, who can modify the agricultural machinery model, and the manufacturer's account can remotely lock the agricultural machinery.

Figure: Schematic diagram of the farm machinery list

Entering the historical operation, you can view the flight information of each flight of the agricultural machinery since the factory.

Enter the log, you can view the flight log uploaded by the user for fault analysis.

5.2.6 Plot management

The manufacturer's account can view all the plot information measured by the account and the company's employee account, and the employee account has the same functional authority.

Figure: plot management schematic diagram
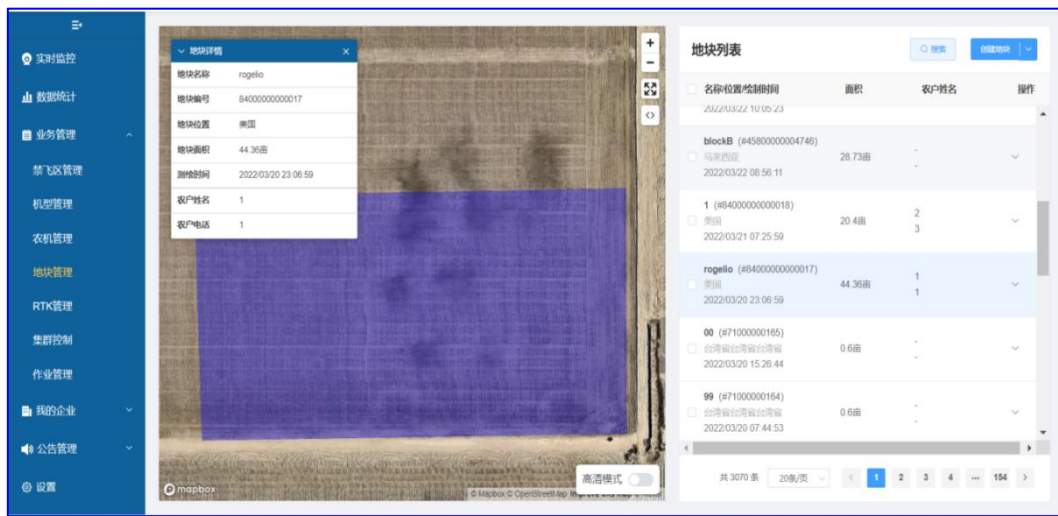
5.2.7 Employee information

Figure: the employee management interface
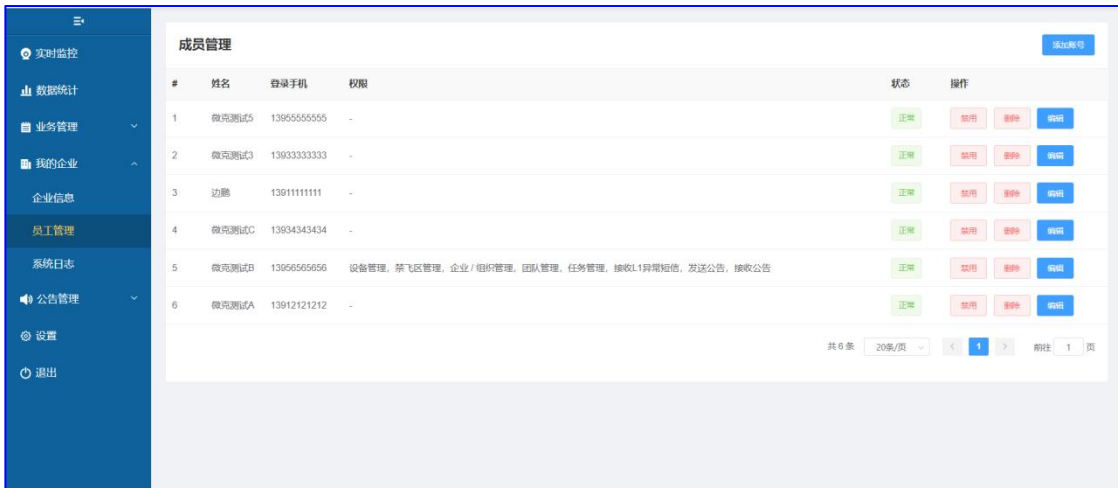
In the employee management interface, you can add an employee account through the mobile phone number by adding an account, or delete the employee account through the delete button.

The added employee account has the same monitoring equipment authority as the manufacturer management account, but it does not have the employee management authority.

About the plant protection data management platform, it is recommended to browse the video tutorial, more direct and detailed.

Plant protection platform video: https://space.bilibili.com/493843514/?spm_id_from=333.999.0.0

6. Instructions for the use of the RTK

6.1 The RTK onboard end

At present, there are two RTK airborne terminals, both of which are 3-star multi-frequency differential board cards. Single antenna RTK has high precision positioning, no dual antenna direction finding function; dual antenna RTK has both high precision positioning and dual antenna orientation function, and has a good anti-magnetic interference capability.

RTK airborne terminal and ordinary GNSS module provide dual redundant positioning function for aircraft. When RTK state is fixed, the system uses the positioning information of RTK module; when RTK state is not fixed, the system uses the positioning information of GNSS module.

RTK module installation precautions:

➢ The single antenna RTK module should be mounted with the arrow of the nose

➢ The two antennas of the RTK must be front and back (ANT1 behind) or right (ANT1 at left) with an antenna distance greater than 40cm

➢ The occlusion resistance of RTK signal is not as good as that of ordinary GNSS. It is normal for some star search stability to become worse in the occlusion environment

6.2 The R T K mobile base station

Mobile base station without mobile network or Chihiro service, the mobile base station can provide high-precision relative positioning, but the absolute positioning has a certain deviation. The mobile base station that purchased Chihiro service can provide high-precision dot mapping and flight operations. The process is as follows:

➢ Enter Settings- -> RTK base station settings, search for RTK base station

➢ After Bluetooth connects to the RTK base station, click check mode, and the base station will automatically access to Chihiro location

➢ After the base station positioning type shows the fixed solution for 30 seconds, click to set the current position to the base station coordinate button, and keep the base station position unchanged to provide a high-precision mobile base station service.

Figure: RTK base station information diagram

Notes for the mobile base station use:

➢ Make sure that the mobile base station battery is sufficient

➢ When mobile base stations provide base station services, the location is unchanged

➢ After the mobile base station enters the check mode, it will no longer provide the base station service. It can power on again or click the current location coordinate button to set the base station to let it work in the base station mode again.

7.data management

7.1 Data download and firmware upgrade

The storage device in the flight control records flight data in real time, and forms the beginning and end of a complete sorties. Access settings- -> logs- -> Read logs to read flight data from the last flight and upload to the server. In case of an accident in the aircraft, the first time to read the log upload server, and notify the relevant technical personnel of the supplier to support.

Go to the Settings- -> Version information page to upgrade the control / IMU / imitation radar / front obstacle avoidance radar / rear obstacle avoidance radar firmware.

Annex 1: Flight control LED light language

	Indicator lamp	state description
red (Combo)		System initialization / magnetic compass
		Poor positioning
		The positioning is very poor
		Low voltage alarm
		Backstage lock
green (Combo)		Compass horizontal calibration
		Attitude mode
		The GPS fixed-point mode
		automatic mode
		Positioning is ready to take off
blue (Displayed separatel		magnetic ass vertical calibration
		Transmission warning
		IMU has no data
		GPS star loss warning
		Speed warning
		Remote control position warning
yellow (Displayed separatel		Additional alarm
		Gyro alarm
		Magnetic force alarm
		Temperature over 65° alarm
purple		Point AB records point A
		Point AB records point A B
		Remote control calibration
		Electric calibration
ching		Set high state is poor
		Poor balance of motor
white		The imitation radar is connected
		The I MU part upgrade

Long flashing

Attachment 2: LED message

BT: Bluetooth indicator, flash indicates that Bluetooth is not connected; long light indicates that the base station Bluetooth and APP links are normal.

RX: When the base station sends an indicator light to flashes a packet of CORS data from the base station. When the base station is operating normally,   This LED should be 1HZ flashing

TX: The base station receives a packet of onboard RTK

FIX: Base station operating status indicator light, the specific flashing significance is as follows:

Continuous flash mob: the APP set the base station coordinates successfully, and the base station working fixed coordinate mode

4 Flash: no positioning

3. Flash: Single-point positioning

2 Flash: RTK position floating point solution, positioning accuracy of sub-meter level

1 Flash: RTK position fixed solution, positioning precision cm level

P_L: Bluetooth and RTK initialization indicator light, the specific flashing significance is as follows:

Continuous flash mob: Enter the check mode

2 Flash: Bluetooth initialization failed

Long bright: normal

GPS: The flashing representative is searching for stars

RTK: not have

Attachment 3: Dual antenna direction finding RTK module lamp language

RX-1: Serial port 1 receives data lights and is often going out.

RX-2: serial port 2 receives data light and normal 1s flash when connecting Chixun data.

ANT-1:1 antenna abnormal light, is often out, often bright red indicates ANT1 open circuit, often bright green indicates ANT1 short circuit.

ANT-2:2 antenna abnormal light, is often out, often bright red indicates ANT2 open circuit, often bright green indicates ANT2 short circuit.

Attachment 4: Video Tutorial address

AG Use video: https://space.bilibili.com/673276730/channel/seriesdetail?sid=2151319&ctype=0