EasyScan™X10

Airborne LiDAR Measurement System

Product Manual

Catalog

1 Product Introduction

1.1 Product Overview

EasyScanTM X10 airborne LiDAR measurement system, is a portable 3D laser measurement system independently developed by Wuhan Eleph-Print Tech Co.,Ltd, it integrates LiDAR module, high-precision inertial navigation module and other modules, has the characteristics of high precision, high frequency, multi echo and so on. The weight and volume are extremely lowered, making the overall weight less than 1.15kg(aerial metric camera and other components not included), greatly improving the endurance of the drone. The system is equipped with modular aerial metric camera, which can be flexible matched according to actual needs. SKYPORT and other customized interfaces are available, which are compatible with DJI M300RTK and other customized drones.

LiDAR control is embedded into the UAV control unit, combined with point cloud and image intelligent photogrammetry parameter algorithm, simple flight planning, greatly reducing the threshold of use. Real-time point cloud display, to understand the ground features condition anytime and anywhere, to improve the timeliness of data. Integrated storage design of laser data and orthophoto, efficient combination of image and point cloud, reducing manual intervention and improving data registration accuracy.

X10 could be widely used in the fields like power line inspection, topographic mapping, agricultural and forestry survey, open-pit mine survey, disaster monitoring and other industries, to meet the data collection requirement of different application scenarios.

1.2 Main Technical Parameters

Main technical parameters of X10 laser measurement system are shown in the table below:

Table 1-1 X10 system main technical parameter

	Item	Parameter
X10 System Parameter	Weight①	1260±10g
	Dimension	ca. L159 W118 D127 （mm）
	System Consumption	25w(typical value)
	Power Supply	10~30VDC
	Device Interface	DJI skyport/other interface available upon request
	Data Storage	256GB U-disk
	Operating Temperature	-10℃ to 50℃
	Storage Temperature	-30℃ to 60℃
	System Accuracy	5cm
	Compatible Platform	DJI M300
		Other UAV models
Laser Scanning Unit	Scanning Principle	Mechanic Rotation Mirror
	Laser Class	Class I
	Wavelength	905nm
	Measurement Range	120m@60% reflectivity （all channel）
	Ranging Accuracy②	0.5cm
	Horizontal FoV	360°

	Vertical FoV	30° （-15°～+15°）
	Scanning Point Frequency	Single Echo: 320000pts/s
		Dual Echo: 640000pts/s
	Echo Mode	Single Echo/Dual Echo
IMU Unit	GNSS Signal Tracking	BDS，GPS，GLONASS，Galileo
	Positioning Accuracy (post-processing)	Plane: 1cm
		Elevation: 2cm
	Position Data Rate	5HZ
	Attitude Accuracy (post-processing)	heading：0.05°
		pitch/roll:0.01°
	Attitude Data Rate	200HZ
Aerial Metric Camera Unit（modular）	Effective Pixels	26MP
	Sensor Dimension	23.5×15.7mm
	Image Resolution	6252×4168
	Image Width FoV③	73°
	GSD	2.3cm@100m flight height

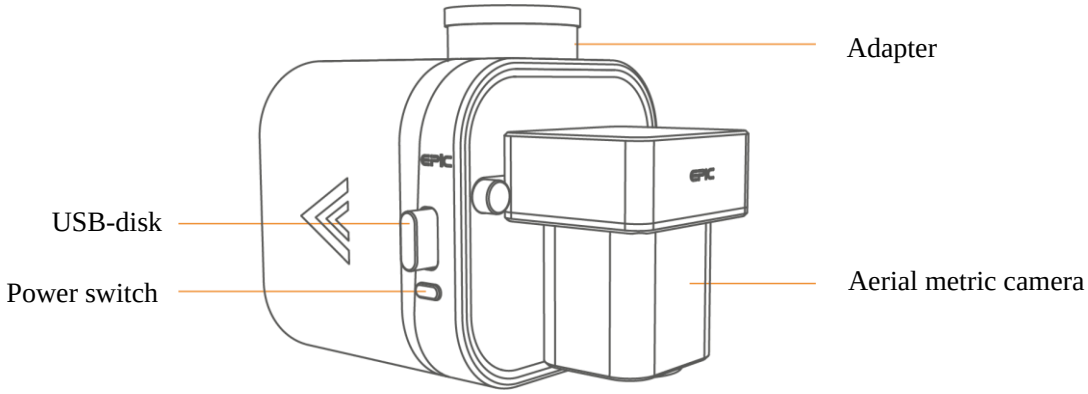
Note：
①**Weight:** including LiDAR main body, GNSS, high-precision IMU and aerial metric camera;
②**Typical value：** the average value measured in channels 5-12, within the range of 0.5 to 70m, outdoor ambient temperature 30℃ and the target reflectivity 50%;
③**FoV:** FoV in the direction perpendicular to the flight route.

2 Product Composition

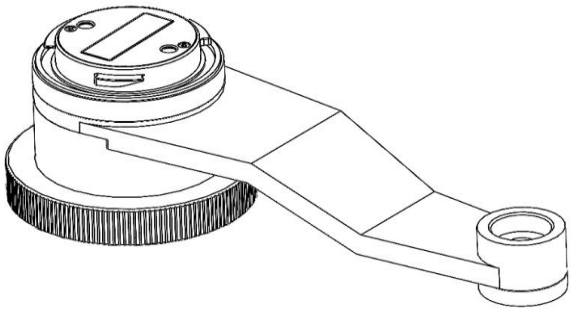
X10 system is mainly composed by main body, aerial metric camera, SKYPORT adaptor, antenna component, high-capacity USB-disk and etc.

2.1 Main Body and Aerial Metric Camera

X10 system main body and interfaces are shown in the figure below.



2.2 SKYPORT Adaptor



2.3 Antenna Component

2.4 High-capacity USB-disk

X10 comes standard with high-capacity USB-disk of 256GB.

3 Equipment Installation and Disassembly

3.1 Preparation Before Installation

Before installing X10 system, please check if the components are complete according to the equipment packing list.

Table 3-1 Equipment Packing List

Type	Sequence No.	Item	Unit	Qty
Equipment	1	X10 main body	PCS	1
	2	Aerial metric camera module(mounted on the main body)	PCS	1
	2	SKYPORT adaptor	PCS	1
	3	Antenna component	PCS	1
	4	High-capacity USB-disk	PCS	1
Others	1	Product Manual (e-version)	PCS	1
	2	Certificate of quality (e-version)	PCS	1
	3	Warranty card (e-version)	PCS	1
	4	Carrying case	PCS	1
	5	Dongle	PCS	1

Note: the above list in only an example, the actual packing list attached with the equipment shall prevail

3.2 X10 System Installation and Disassembly

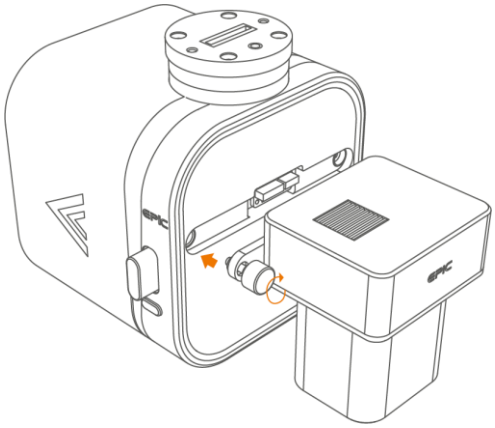
Warning:

- **When installing X10 system, please handle with care to protect equipment;**
- **During the installation and disassembly of the equipment, please ensure the UAV is switched off to avoid damage to the equipment due to live operation;**

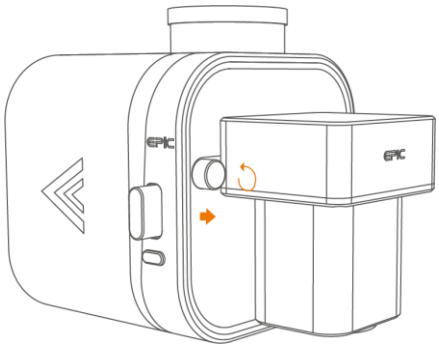
- **After disassembling the equipment, please put all the parts of the equipment back to the carrying case according to their positions and check whether the parts are complete.**

3.2.1Aerial metric camera installation and disassembly

The aerial metric camera is connected to the LiDAR main body by two hand screws. Step1, align the metal contacts at the bottom of the camera with the connector and place it in the mounting slot; Step2, tighten the hand screws on both ends of the connector by hand and further tighten the screws by a Phillips screwdriver.



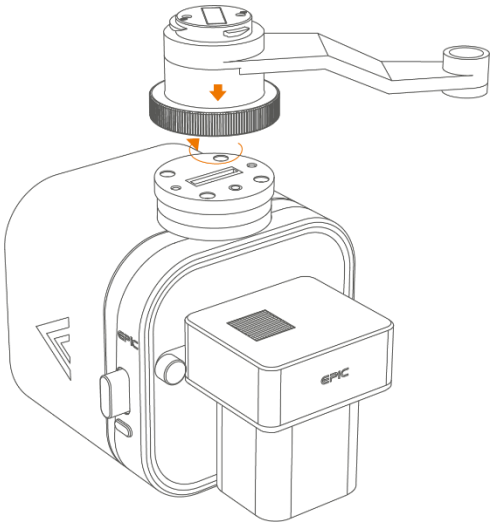
Disassembly of the aerial metric camera from the LiDAR main body. Use a Phillips screwdriver to remove the two hand screws on each end of the connector to remove the aerial metric camera.



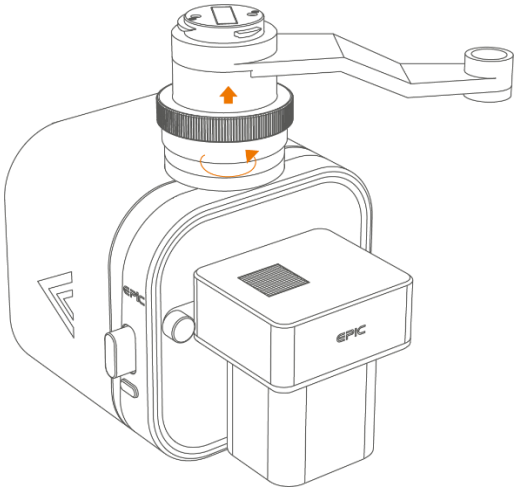
3.2.2 SKYPORT adaptor installation and disassembly

Installation between the SKYPORT adaptor and the main body. Step1, insert the SKYPORT adaptor to the main body in the direction of the down arrow in the figure, in which a socket is set to avoid reverse insertion; Step2, rotate the fix ring clockwise

in the direction of the rotating arrow as shown in the figure to fix and install the SKYPORT and the main body.

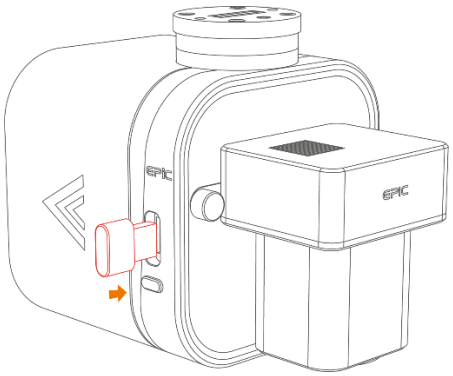


Disassembly of the SKYPORT adaptor from the main body. Step1, rotate the fix ring counterclockwise in the direction of the rotating arrow as shown in the figure to separate the SKYPORT from the main body; Step2, pull the SKYPORT adaptor upwards to remove the SKYPORT adaptor.



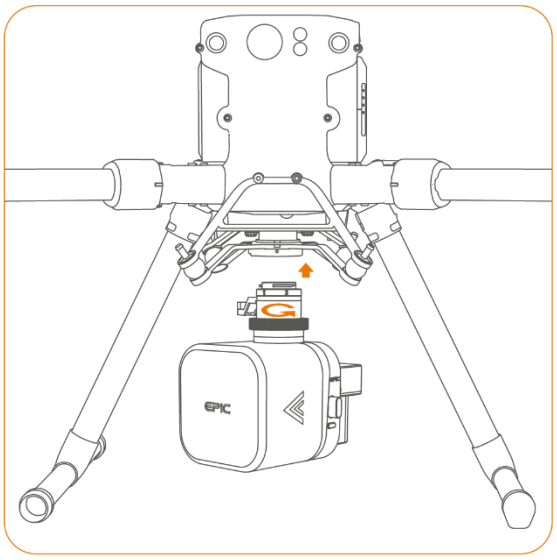
3.2.3 High-capacity USB-disk installation

As shown in the figure below, align the USB-disk with the USB socket and insert the USB-disk into the socket.

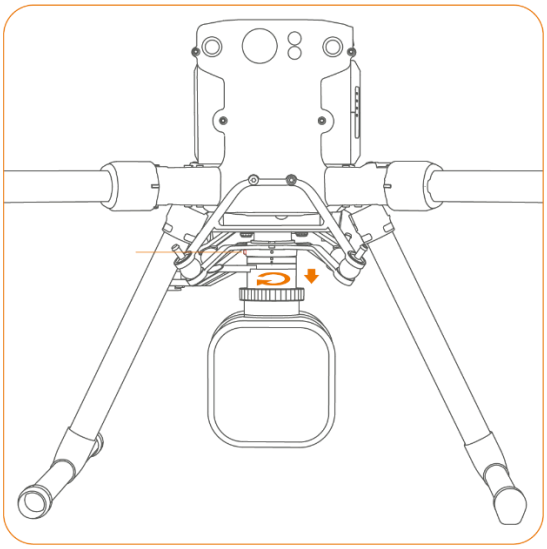


3.2.4 Main body installation and disassembly

The white circular mark on the main body corresponds to the red circular mark on the UAV rack. After stuck, rotate the main body counterclockwise in the direction of the rotating arrow shown in the figure. The red circular mark on the SKYPORT adaptor corresponds to the red circular mark on the UAV rack, if a “click” is heard and the equipment can’t be twisted, it means the installation is successful.

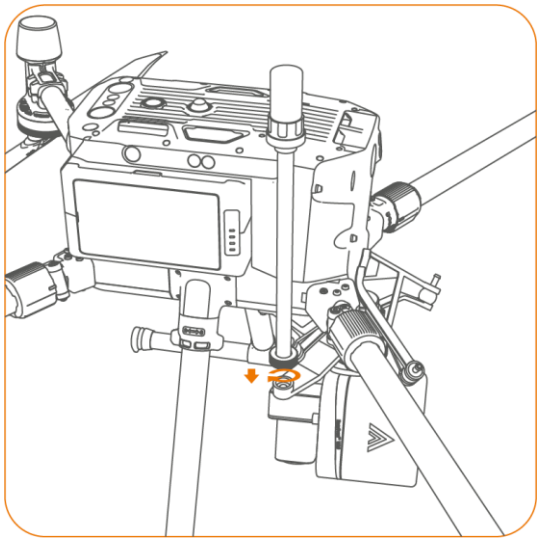


The red circular mark on the main body corresponds to the circular mark on the UAV rack. Press the button indicated by the arrow shown in the figure, and rotate the equipment clockwise as in the direction of the rotating arrow in the figure, when the white circular mark on the SKYPORT adaptor aligned to the circular mark on the UAV rack, the equipment can be removed to finish the disassembly.

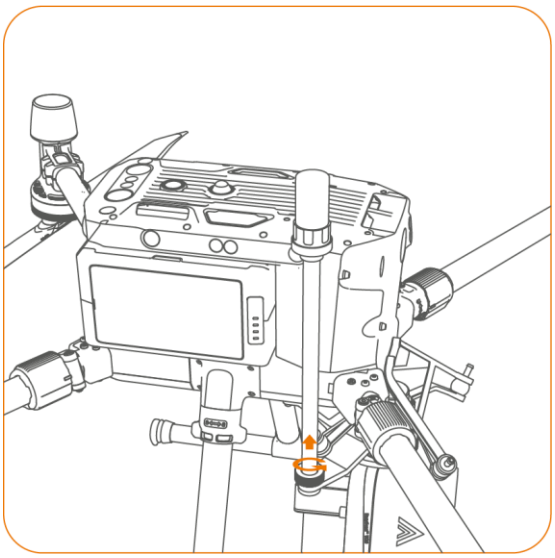


3.2.5 Antenna component installation and disassembly

After the equipment is mounted on the UAV, insert the GPS antenna component to the SKYPORT adaptor in the direction of the arrow shown in the figure, then twist the fixing buckle in the direction of the rotating arrow to lock it. The installation is complete.



Firstly loose the fixing buckle in the direction of the rotating arrow in the figure, then pull out the antenna component upwards to finish the disassembly.



4 Equipment Operation

4.1 Equipment Start

After the equipment installation is completed according to the steps described in Section 3.2, the X10 system can be used.

Turn on the UAV, wait for 2 seconds, then press the power button of the X10 main body, the indicator lights up, the equipment starts;

After the indicator turned to green from the red flashing status, the equipment connection succeeded, the system starts normally.

Note: Since it takes time (usually 2 min) to initialize the equipment after startup, please wait patiently during the initialization period of the equipment.

4.2 Main Body Connection

X10 system has embedded the equipment control to the UAV control unit. Use the UAV control unit, open the X10 control software, enter a project to be executed or a new flight project, wait for about 10 seconds in the control interface, in the upper left part of the control software interface, the status bar will indicates the equipment is successfully connected.

4.3 Main Body Shutdown

After the system stopped data collection and finished the data transmission, click "Power Off" button on control software client to shut down the equipment.
After the status indicator of X10 main body is off, shut down the UAV to finish the equipment main body shutdown.

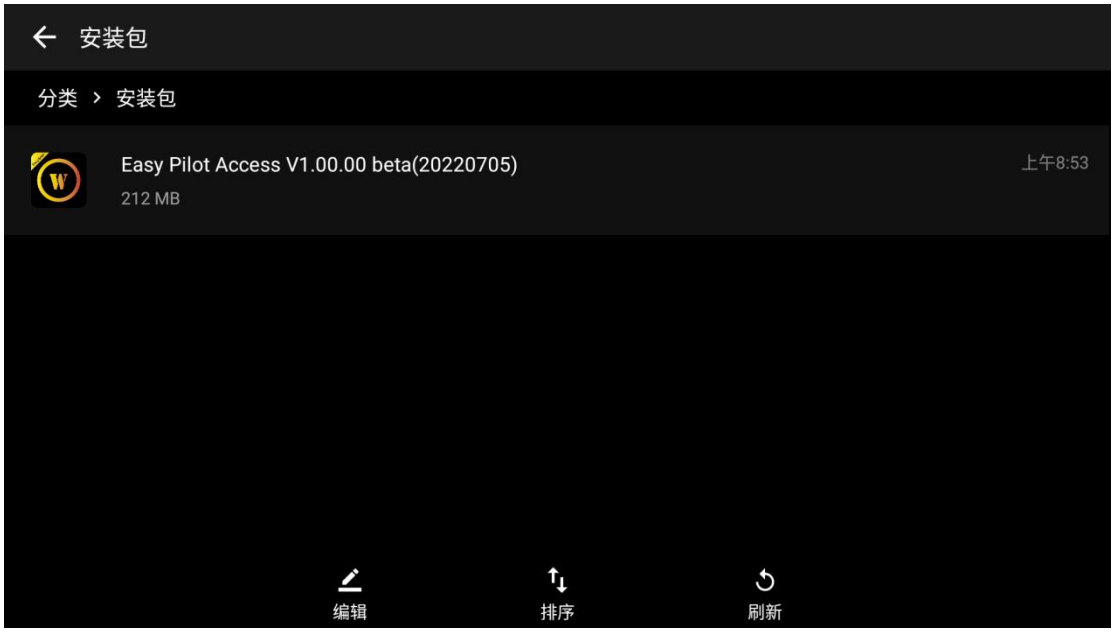
Warning:

- **Please don't cut off power supply directly when the main body is not completely shut down to prevent equipment damage.**
- **Please don't plug and unplug the equipment and USB-disk with power to prevent equipment damage.**

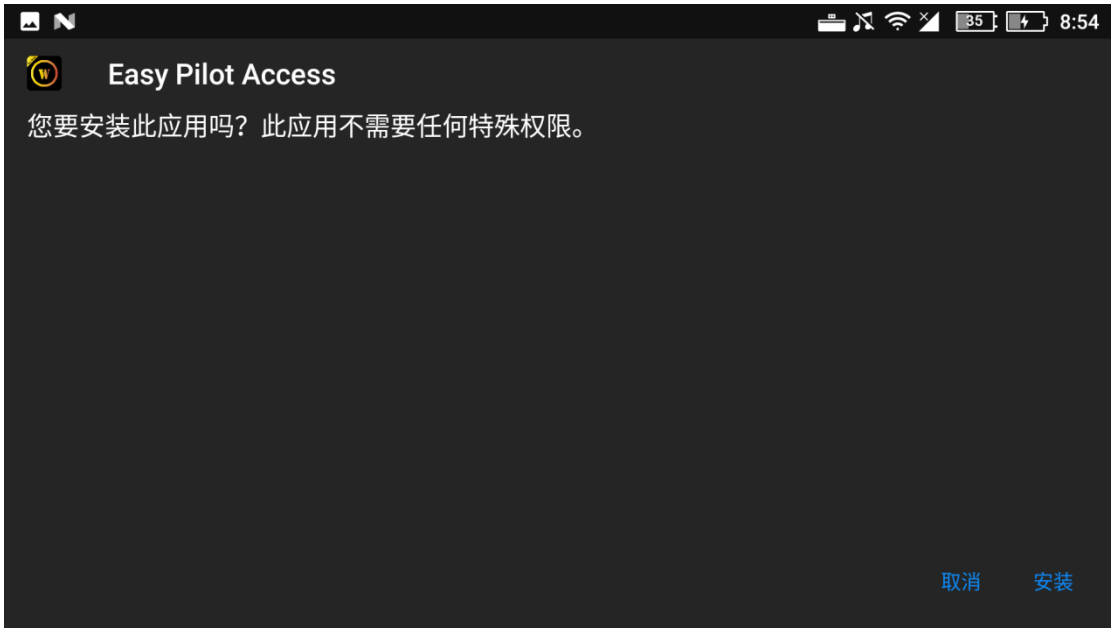
5 Data Collection

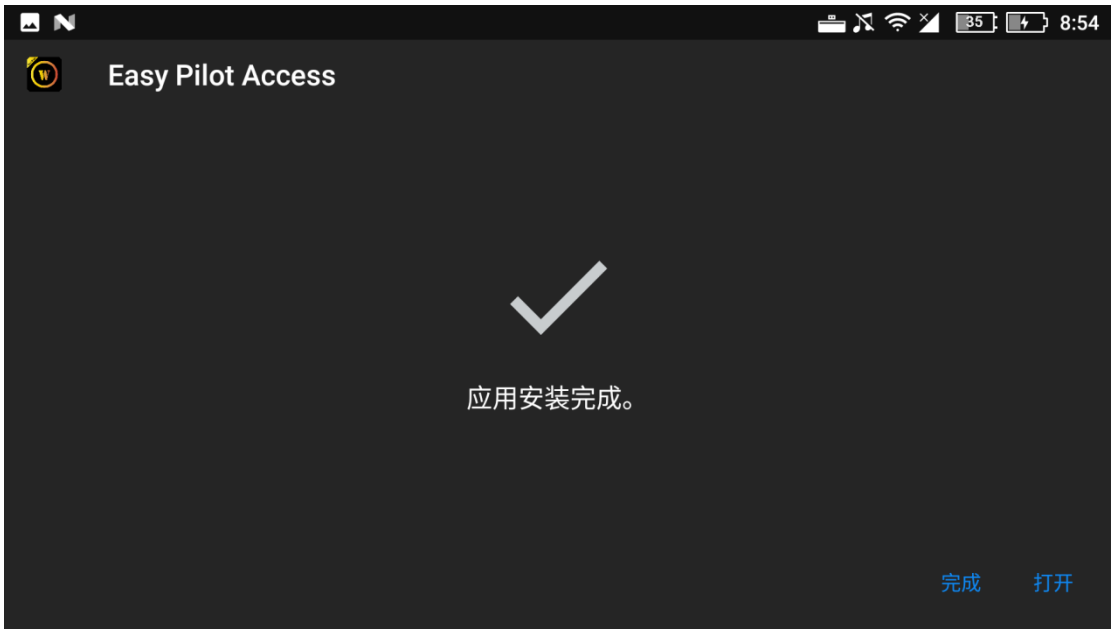
5.1 Client Installation

Method 1: insert the TF card into the M300 remote control, read the control software installation package "EasyPilotAccess" in the TF card and click to install.
Method 2: download the W series product control software installation package from the download interface on the official website, connect M300 remote control to PC via data cable, copy the downloaded installation package "EasyPilotAccess" to remote control storage. Find the installation package on the remote control operation interface, click to install.

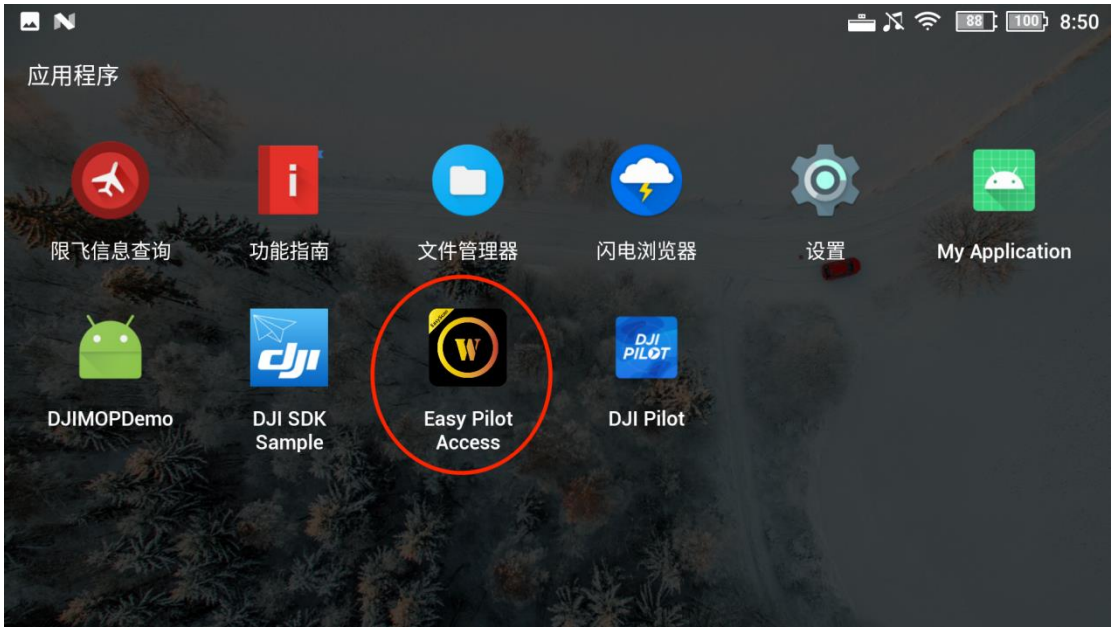


In the pop-up permission dialog box, authorize the required permission for the software, if not, the software may not be installed successfully. Click Continue to install and wait for the software installation to complete.


8:54
Easy Pilot Access
您要安装此应用吗？此应用不需要任何特殊权限。
取消
安装

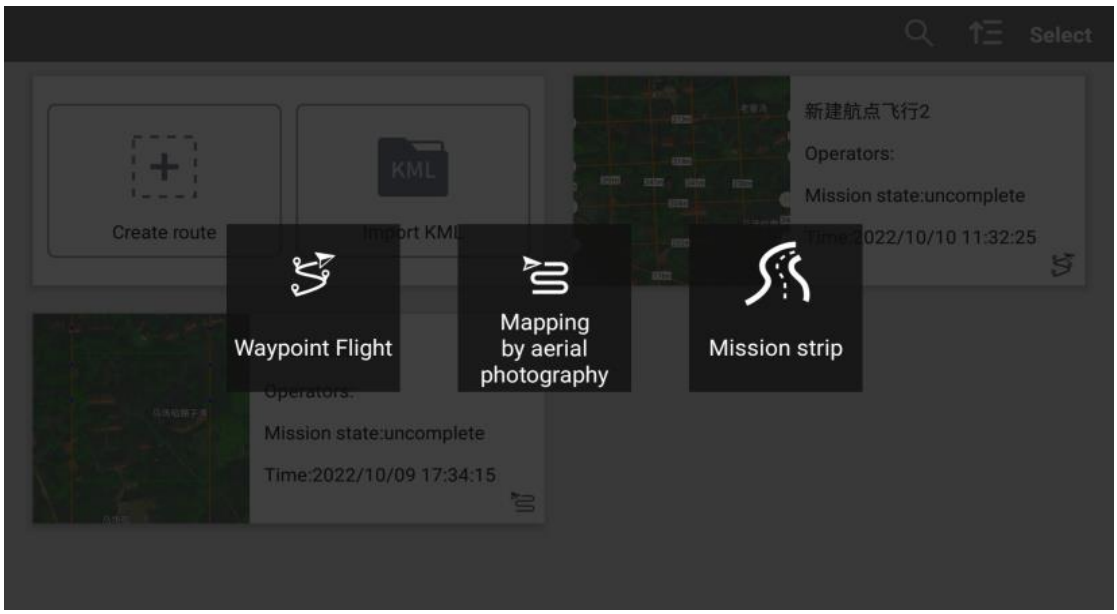

8:54
Easy Pilot Access
应用安装完成。
完成
打开

5.2 Flight Planning



Click icon to open the control software. Two modes of “Create Flight” and “Import KML” can be chosen.

5.2.1 Create flight mode

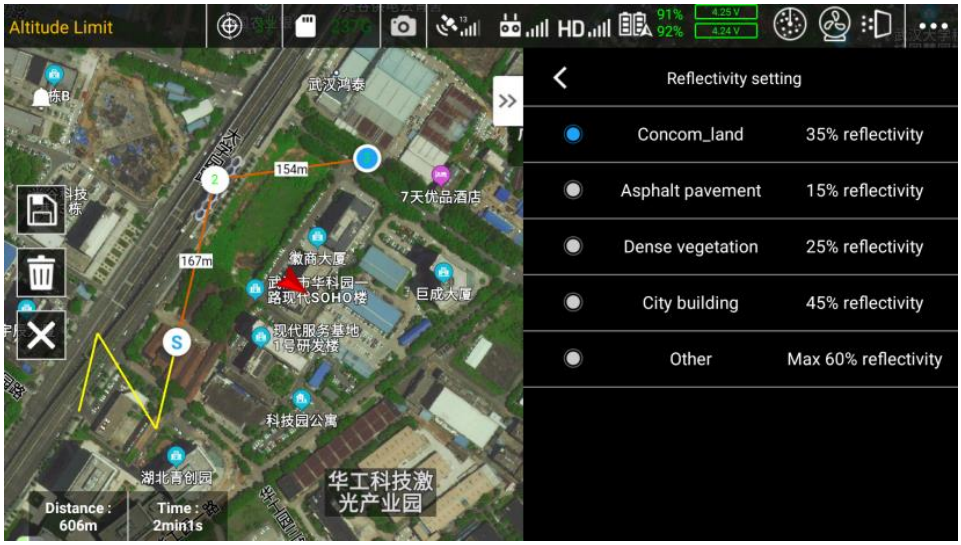


Under Create Flight mode, there are three task modes can be selected, “Waypoint Flight”, “Mapping by aerial photography” and “Strip Flight”.

5.2.1.1 “Waypoint Flight”

The waypoint flight mode operation is as follows:

Manually click the map to add waypoint, the UAV will fly according to the connection sequence of the waypoints. Click a waypoint to select it, and long press the waypoint to drag its position. After setting the flight, open the menu bar on the right side, the arrow key at the bottom can also be used to fine-tune the waypoint position. Select the corresponding LiDAR model on the menu bar interface (If the equipment is connected, APP will automatically identify the equipment model). Set flight height, flight speed, emit frequency, scanning angle, actions after completing the flight according to the requirements.

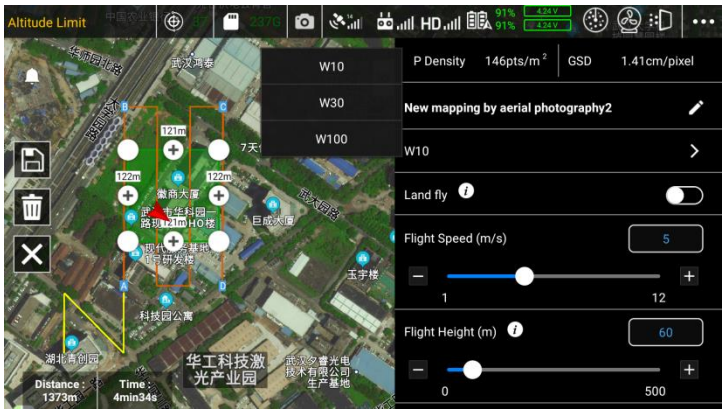


In the detailed menu interface, ground reflectivity and single waypoint parameters can also be set. After the ground reflectivity is set, the flight height will be limited. If the set flight height exceeds the maximum flight height of the current ground reflectivity, the number of the flight height options will turn yellow.

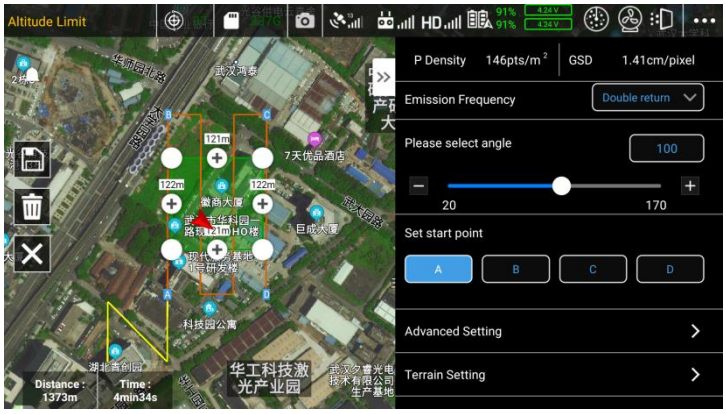
Click “  ” on the left side to save flight.

5.2.1.2 “Mapping by aerial photography”

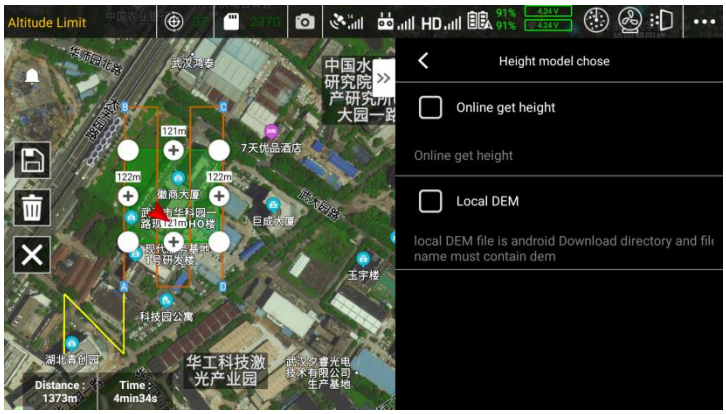
The Mapping of aerial photography operation is as follows:



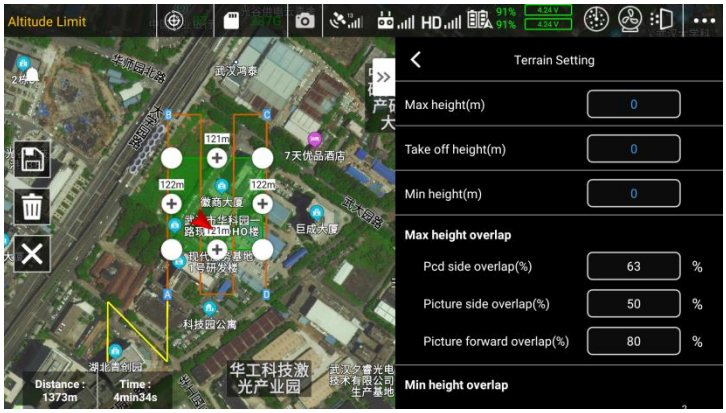
Select a task area manually on the map, long press the corner point to drag the point and modify the location of the area boundary. Click the “+” symbol between the two corner points to add a new corner point between the two corners to adjust the task area. After setting the task area, open the menu bar on the right side, select your LiDAR model (If the equipment is connected, APP will automatically identify the equipment model). Set flight speed and flight height. The required point cloud and image overlap can be set in advanced settings.



After setting the overlap, adjust the flight height, APP will automatically calculate the flight interval to generate flight according to the set overlap. Entry point “A,B,C,D” can be selected according to the takeoff position.



If Terrain Follow is selected, the “Elevation Mode Select” menu will pop up, select online elevation model or local DEM file (Local DEM file name must contain “DEM.tif”, and be placed under the remote control Download folder to be recognized)

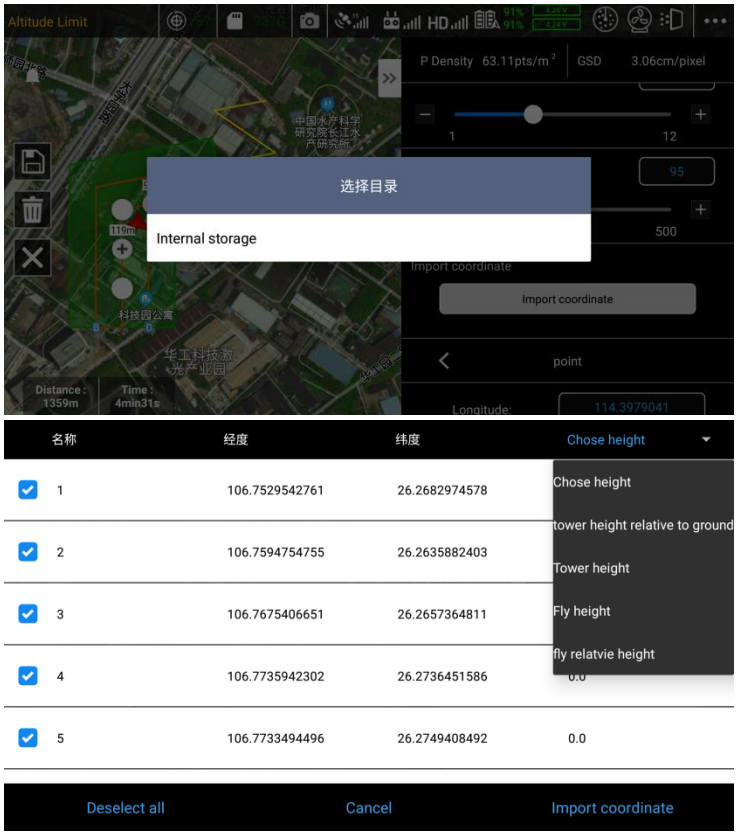


Input the survey area information in the Terrain setting menu, APP will automatically calculate the highest point and lowest point according to your flight, so as to judge if the lowest point and highest point could meet the project requirements.

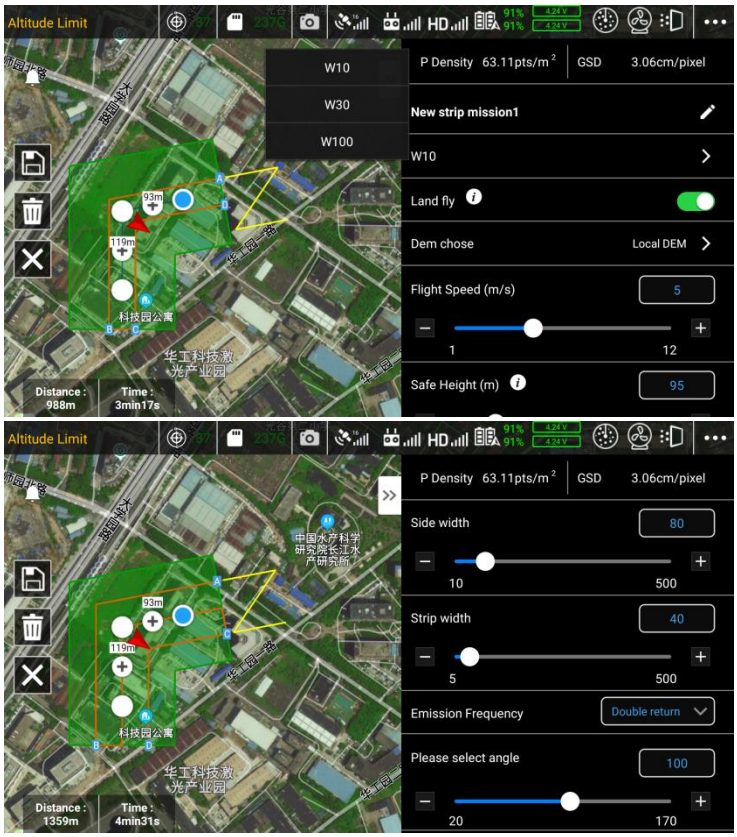
Click “  ” icon on the left to save flight.

5.2.1.3 “Strip Flight”

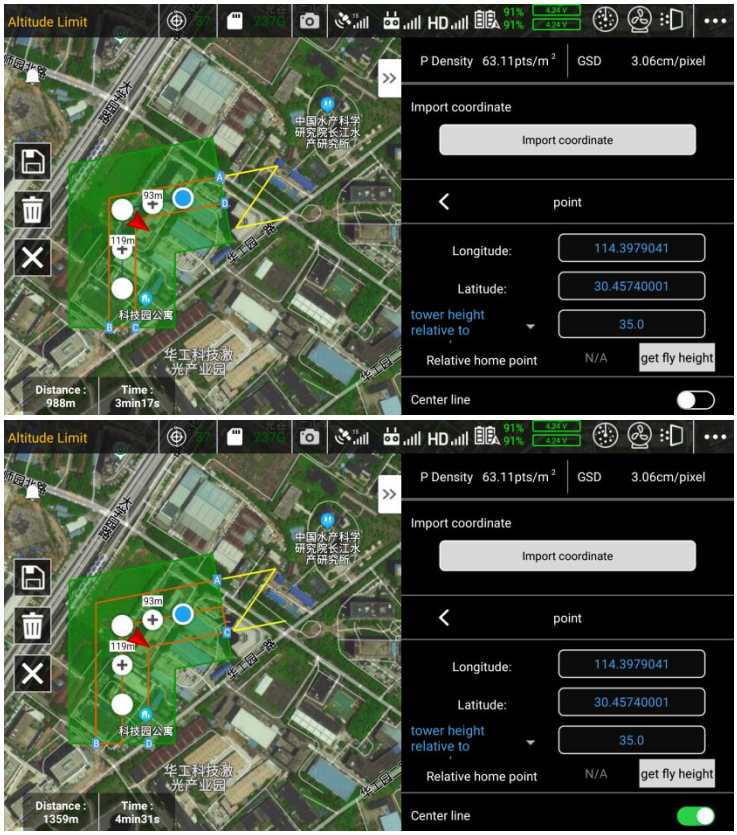
For Strip Flight, the selected points on map can be used to create centerline, or KML file imported can be used to generate centerline.



Select Import Coordinate Point, find the path where KML file is placed in the internal storage of the remote control, select corresponding KML file, select the points to me imported, select the elevation definition of the points, import.

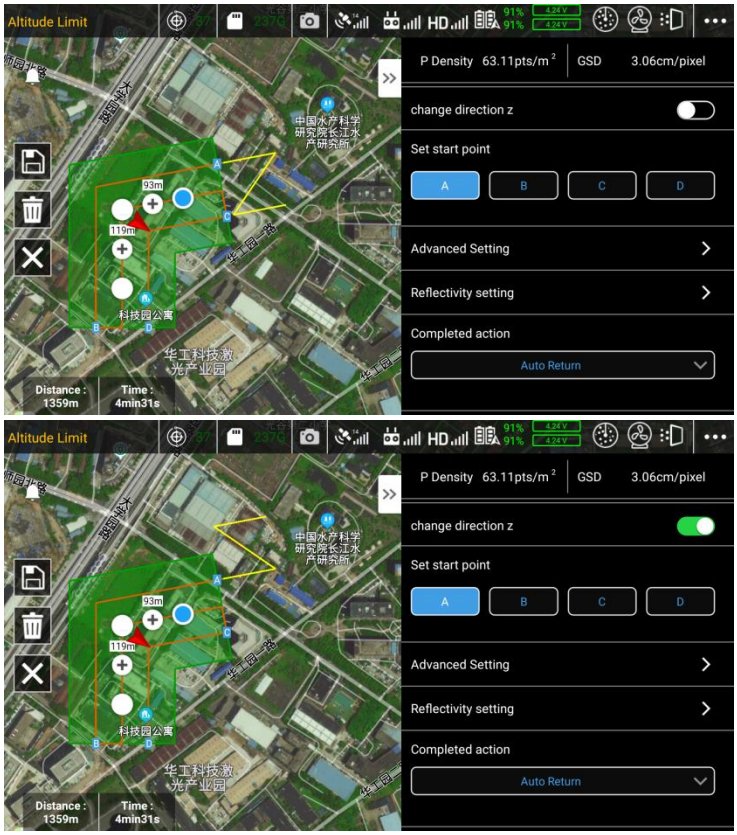


Select appropriate flight speed and required single-side expansion width.



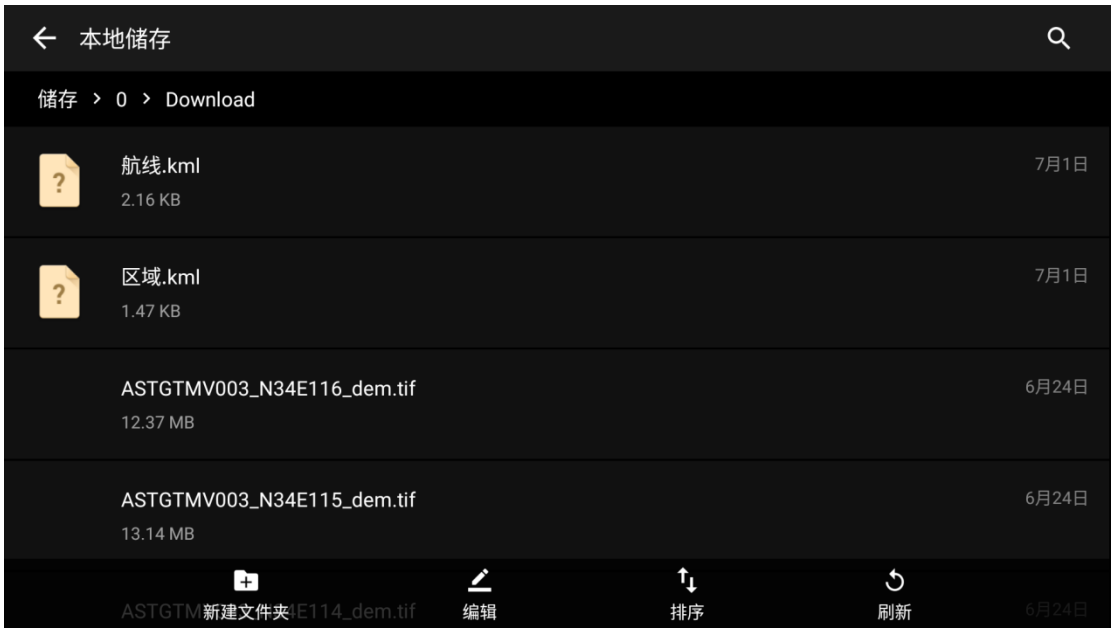
Choose to keep centerline or not.

When obtaining the altitude of the takeoff point, the local DEM should be placed under the Download folder, and the remote control can be networked to obtain the aircraft position.



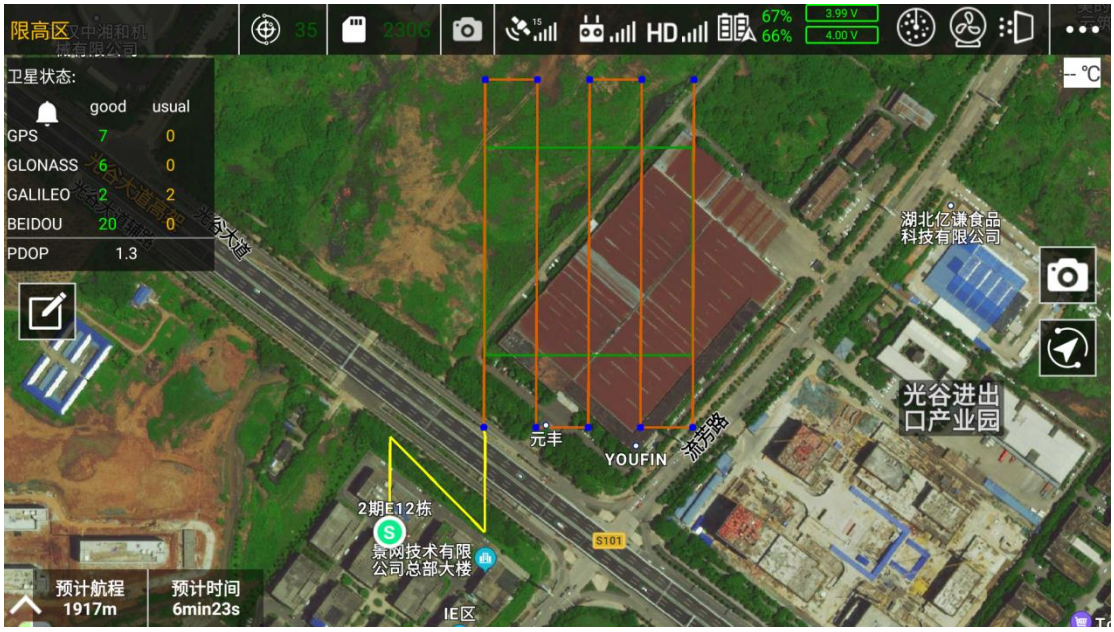
Same as “Mapping by aerial photography”, “Strip flight” can also select A/B/C/D positions to start flight. If the dynamic alignment flight is too close to the building, “Reverse Z” can be selected to change the alignment flight direction.

5.2.2 Import KML



Before using “Import KML” mode to create new flight, copy KML file to M300 remote control: local storage - 0 - Download path.

Open APP, click “Import KML”, APP will recognize KML file in the directory. Check the required KML file, click “Import”.

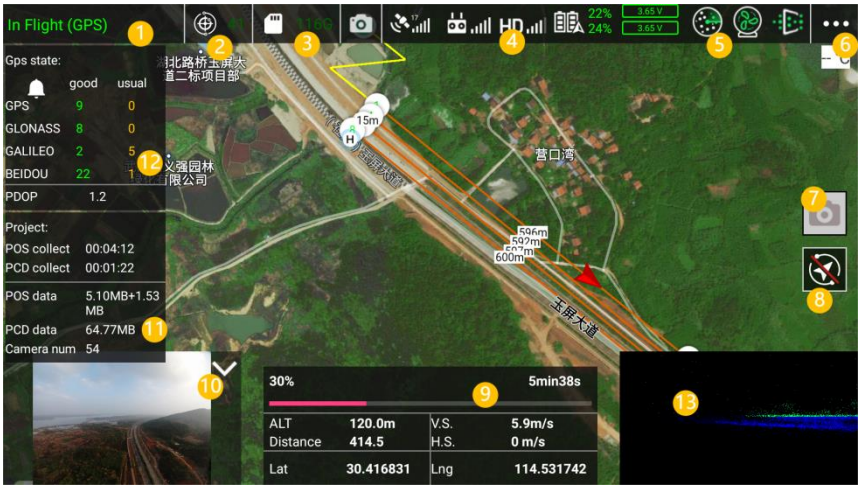


APP will automatically generate flight according to the imported KML file.

5.3 Equipment Control

5.3.3 Software interface

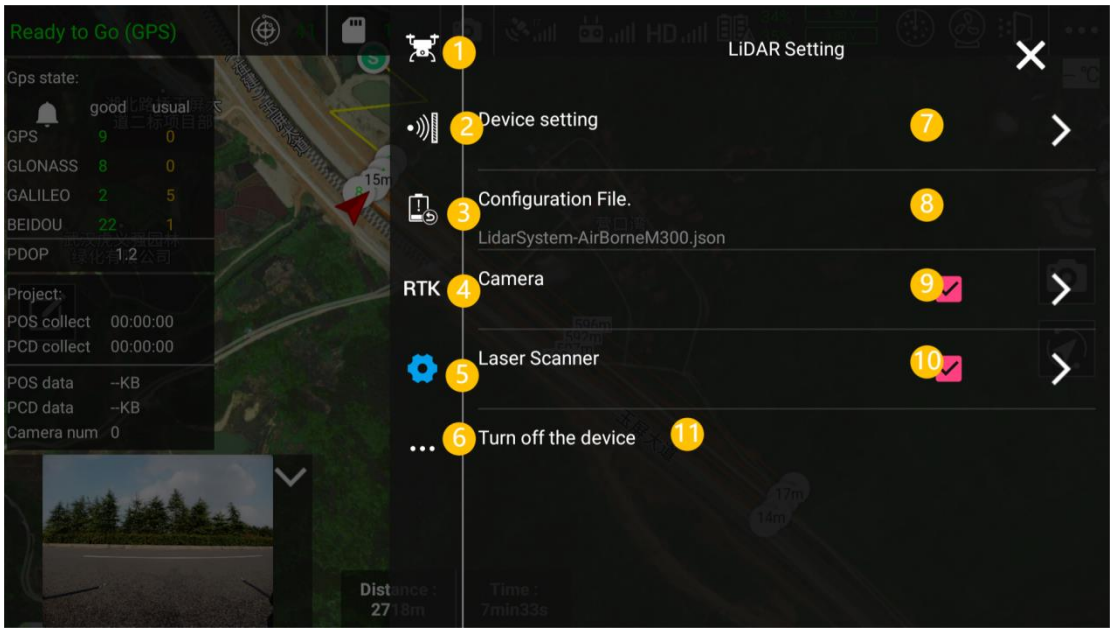
5.3.3.1 Base interface



1. UAV Status
2. Number of LiDAR Satellites
3. Remaining Storage Capacity
4. Number of UAV Satellites, Remote Control Signal Strength, Image Transmission Strength, UAV Battery Power
5. POS Collection Status, LiDAR Internal Motor Rotation Status, Point Cloud Data Collection Status
6. Setting Menu
7. Photo Button(used to trial photo shooting on the ground)
8. One-click Start/Stop Point Cloud Project
9. Flight Parameters and Implementation
10. UAV FPV lens
11. Project Information: POS data size, point cloud data size, number of photos

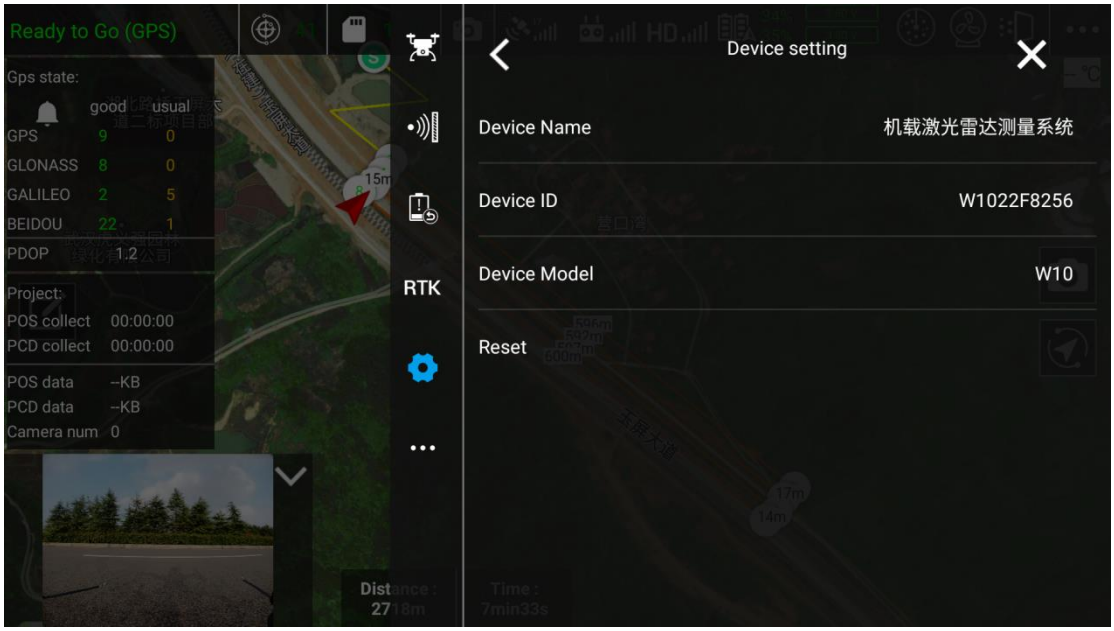
12. Information of Satellites received by LiDAR: number of satellites shows the current satellite searching quality and positioning system used; PDOP is the 3D(spatial) position precision factor.
13. Real-time Point Cloud Preview

5.3.3.2 Setting Menu Interface

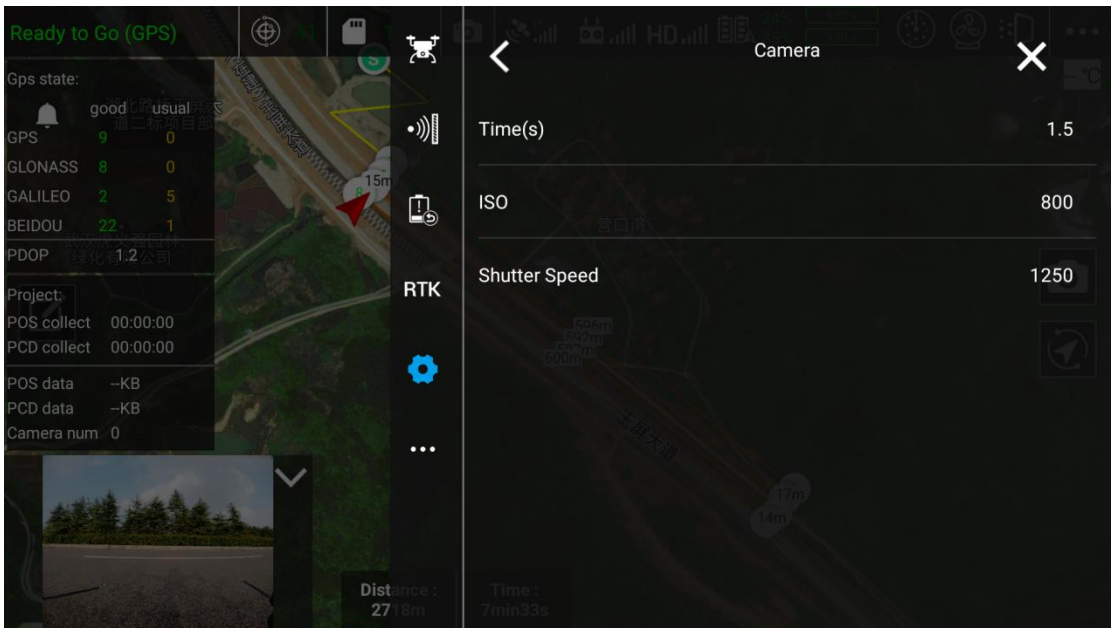


1. UAV Setting
2. UAV Obstacle Avoidance System Setting
3. UAV Battery Warning Setting
4. UAV RTK Positioning Setting
5. LiDAR Setting
6. Other Setting
7. LiDAR Equipment Information
8. LiDAR Carrier Configuration File Selection
9. Laser Scanner Setting: include real-time point cloud and LiDAR protection function setting
10. Camera Parameter Setting
11. Turn Off LiDAR

5.3.3.3 Equipment Information Interface



5.3.3.4 Camera Setting Interface



5.3.4 Data collection

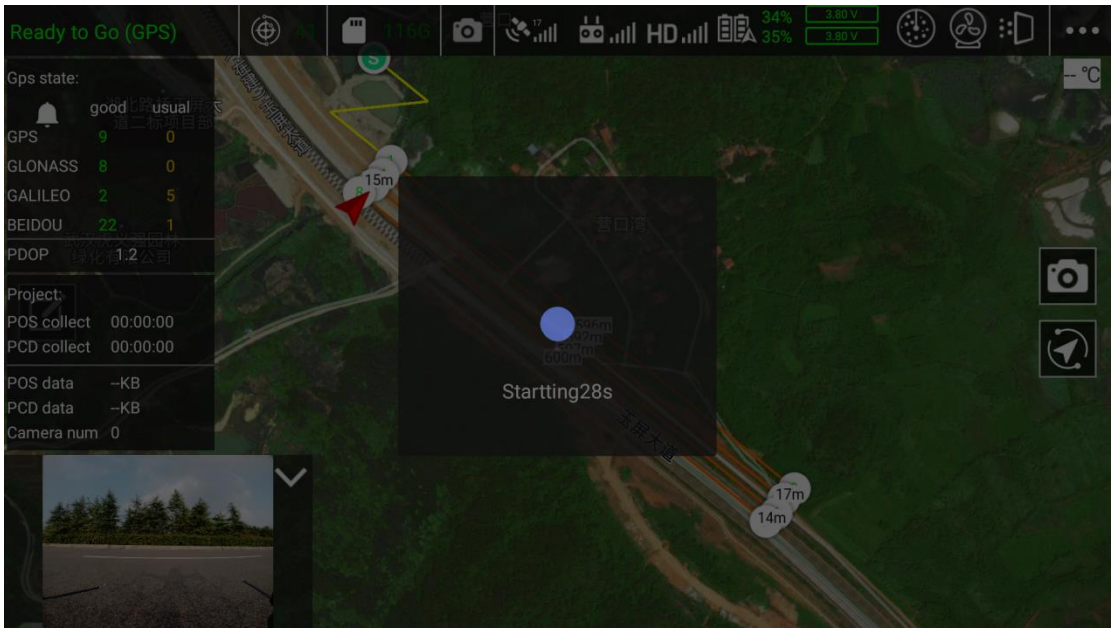
5.3.4.1 Flight planning

Use Flight Planning function or Import KML to generate flight

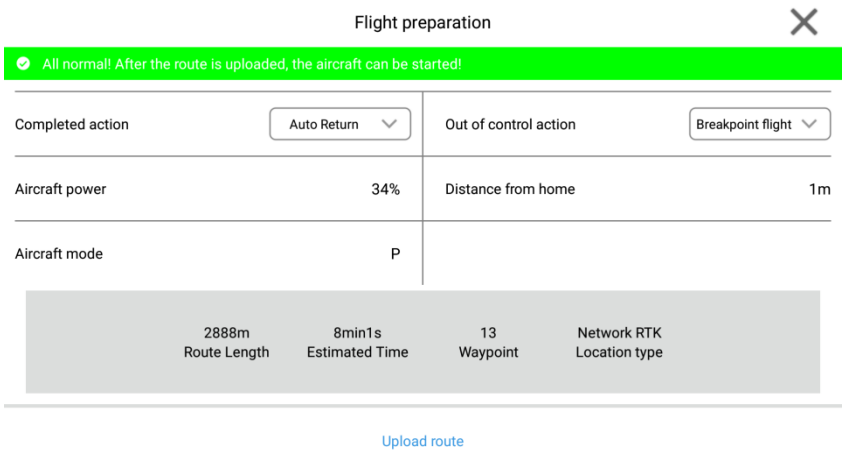
5.3.4.2 Select flight

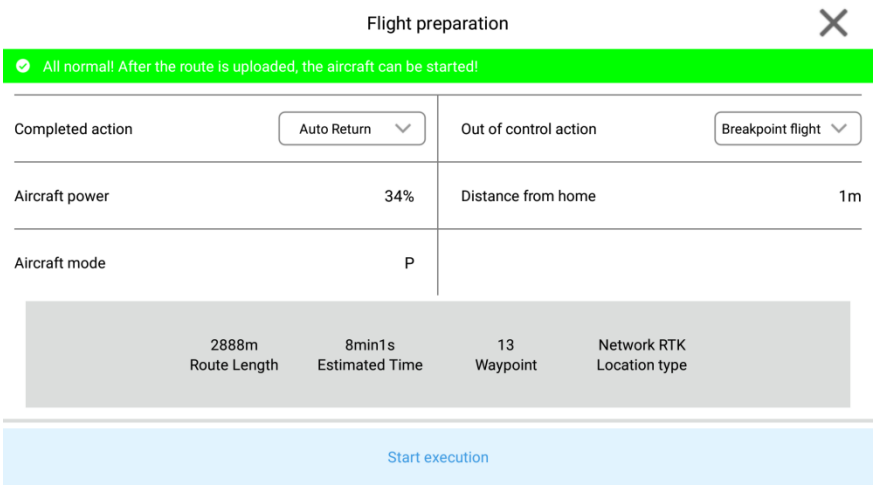
Select a planned task

5.3.4.3 Start project



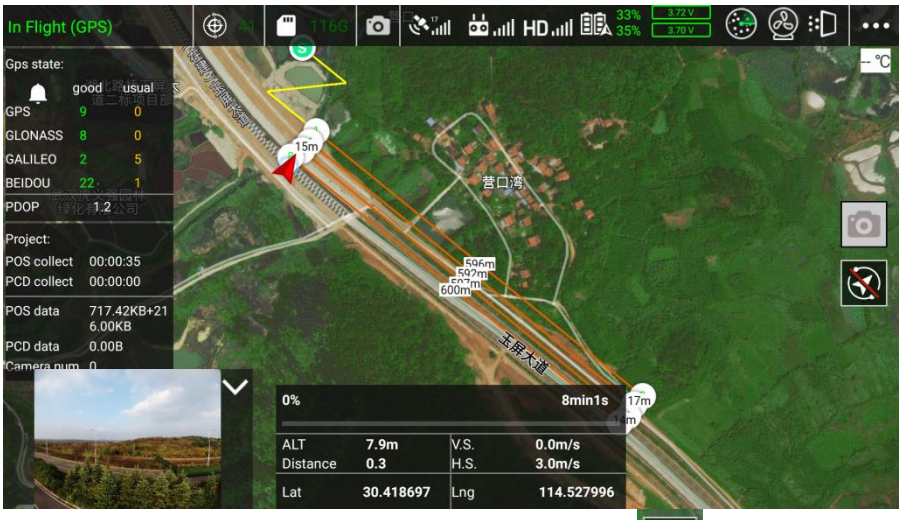
Click “  ”button, equipment will automatically record POS data,start project.





1. Select corresponding actions of flight completion and remote control disconnection, click to upload flight.
2. After the flight upload is completed, personnel should stay away from the UAV and ensure the area is free of obstacles, then click to start execution.

5.3.4.4 End project



After the flight execution is completed, click “ ”button to end project, system will pop up a confirm window, click “Stop Collection” in the confirmation window as shown in the figure below, then the

equipment will stop data record and automatically perform dynamic alignment to end project.

6 Appendix

6.1 Routine Maintenance

- Please handle the equipment with care to avoid collision;
- After the data collection of LiDAR, the laser protective cover should be installed to prevent the LiDAR to be scratched;
- LiDAR should be protected in daily use to avoid scratches on its appearance, if there is dust, please use non-dust cloth dipped in water to gently wipe it clean;
- After using the equipment, it is necessary to remove the accessories from the main body, and put the main body and all the accessories in the carrying case.

FCC Caution.

- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.
-
- Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
-
- Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- -Reorient or relocate the receiving antenna.
- -Increase the separation between the equipment and receiver.
- -Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- -Consult the dealer or an experienced radio/TV technician for help.
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- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.