CHCNAV P330 Pro VTOL UAV

Quick Start Guide



MAPPING & GEOSPATIAL | May 2021

Make your work more efficient

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1 Preface

Copyright 2022

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Trademarks

All product and brand names mentioned in this publication are trademarks of their respective holders.

Safety Warnings

The Global Positioning System (GPS) is operated by the U.S. Government, which is solely responsible for the accuracy and maintenance of the GPS network. Accuracy can also be affected by poor satellite geometry and obstructions, like buildings and heavy canopy.

The P330 Pro Quick Guide describes how to set up and use the CHCNAV® P330 Pro UAV. In this manual, “the UAV” refers to the P330 Pro UAV unless otherwise stated.

Even if you have used other Unmanned Surface Vessel before, CHCNAV recommends that you spend some time reading this manual to learn about the special features of this product. If you are not familiar with UAV, go to www.chcnav.com for an interactive look at CHCNAV and UAV safety information.

Warnings and Cautions

An absence of specific alerts does not mean that there are no safety risks involved.

A Warning or Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.

 WARNING – batteries for UAV should be full charged if only one LED light on the battery is on.

 CAUTION –it is necessary to check the motors whether they are working well via the ground control software before taking off.

Regulations and Safety

The receivers contain a built-in wireless modem for signal communication through wireless technology. Regulations regarding the use of the wireless modem varies greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. However, in some countries, the administrative permissions are required. For license information, consult your local dealer.

Before planning a mission, please following local civil aviation administration instruction whether an authorization or a license to operate the unit is required in your country.

Use and Care

This P330 Pro is a vertical take-off and landing unmanned aerial vehicle, any faulty components could cause a crash. In addition, the UAV is a high-precision electronic equipment and should be treated with reasonable care.

 CAUTION - Operating or storing the UAV outside the specified temperature range would cause irreversible damage.

Technical Support

If you have a problem and cannot find the information you need in this manual or CHCNAV website (www.chcnav.com), contact your local CHCNAV dealer from which you purchased the receiver(s).

If you need to contact CHCNAV technical support, please contact us by email (support@chcnav.com) or Skype (chc_support).

Disclaimer

Before using the UAV, please make sure that you have read and understood this Quick Start Guide, as well as the safety information. CHCNAV holds no responsibility for the wrong operation by users and for the losses incurred by the wrong understanding about this Quick Start Guide. However, CHCNAV reserves the rights to update and optimize the contents in this guide regularly. Please contact your local CHCNAV dealer for new information.

Your Comments

Your feedback about this user guide will help us to improve it in future revision. Please email your comments to support@chcnav.com.

2 Getting Started with P330 Pro

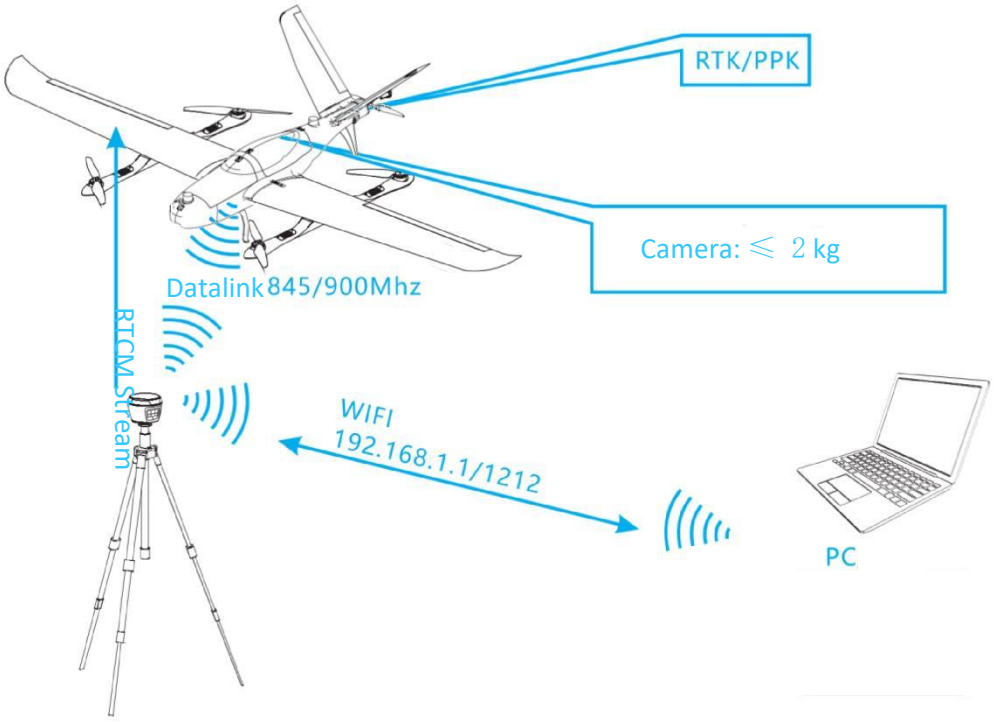
2. 1 Introduction

The P330 Pro is a high-performance vertical takeoff and landing (VTOL) fixed-wing unmanned aircraft system (UAS), specially designed for aerial surveying and mapping applications.

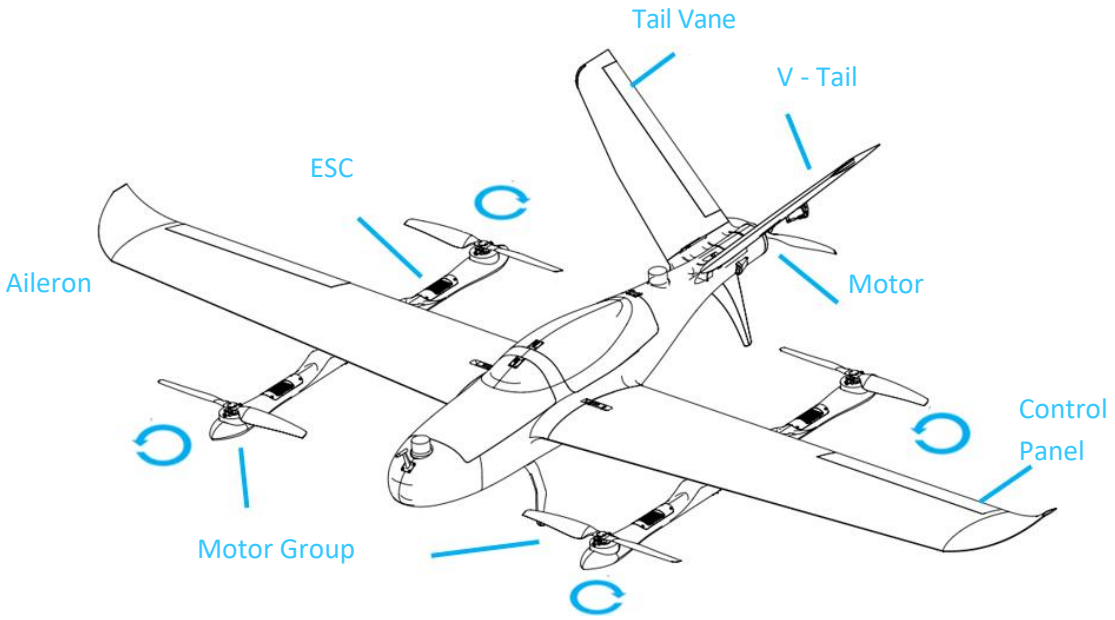
With its concept of high accuracy, long endurance and multiple payloads, it meets the requirements of mapping and aerial surveying professionals for many different applications. The P330 Pro features a 100 Hz differential module, which allows aerial mapping operations at the centimeter level, and a flight endurance with payload reaching more than 150 minutes.

The VTOL P330 Pro UAV allows you to conduct small- and large-scale aerial surveys with extreme data quality and at significant time and cost savings. The CHCNAV P330 Pro is an alternative to manned aircraft for surveying and mapping, mining, construction and infrastructure, environmental monitoring, agriculture, etc.

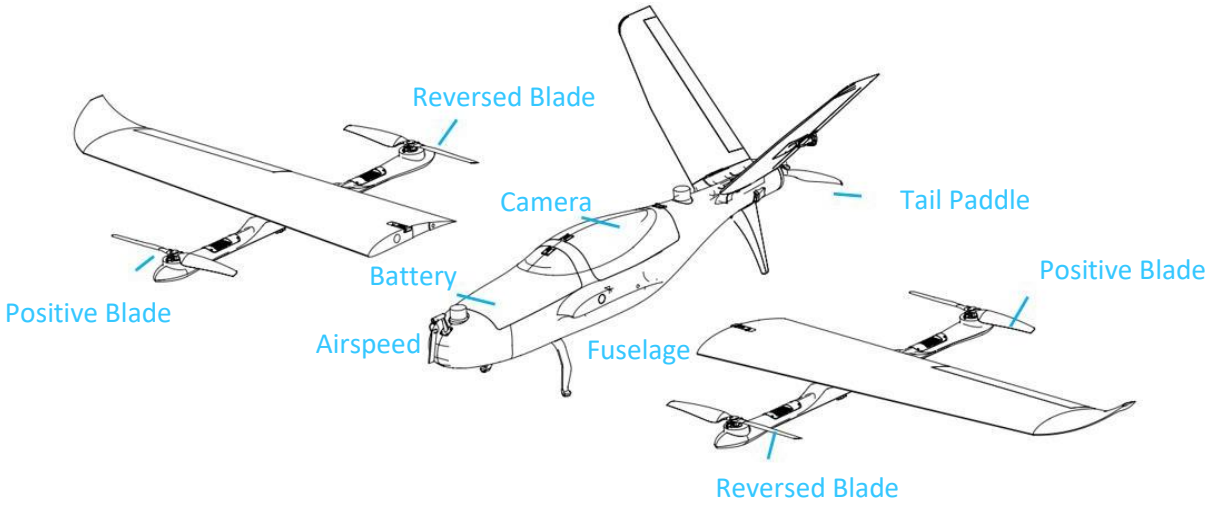
System composition:



Component introduction:

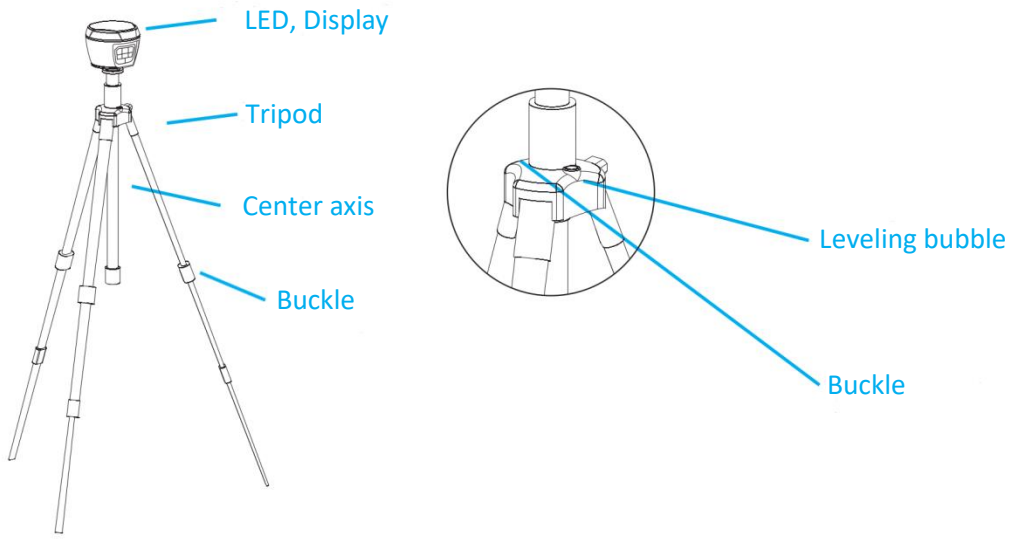


With modular design, P330 Pro is easy for transportation, assemble and disassemble.



(1) Fuselage: contains airspeed, RTK dual antennas, battery compartment, payload compartment, flight control system, compass, tail power system, etc.
(2) Wing group: contains rotor wings, aileron, which is used to provide lift force, and control yaw directions.
(3) V tail: controls the pitch of the drone.
(4) Camera: support CHCNAV orthophoto camera HC15 and HC16; oblique camera DG3 and DG4; Sony orthophoto camera α7RII and α7RIV.
(5) Sensors: gyroscope, compass, airspeedometer, barometer, thermometer, accelerometer.

Base Station:



2. 2 Specifications

Items	Parameters
Fuselage Length	1. 21 m
Wingspan	2. 53 m
Limit weight	14 kg
Maximum flight altitude	6500 m
Speed of flight	76 km/h
Power motor	1 Fix-wing motor and 4 Rotor-wing motors
Carrying capacity	2 kg
Transportation case dimension	1280mm*570mm*435mm
Wind resistance	Level 6
The maximum communication distance	15 km
Work time	160min(idler)/135min(full)
The way of takeoff	vertical takeoff
Work efficiency	30 km^2 every flight (Orthophoto 10 cm/1:1000)

2. 3 Power system

P330 Pro is a vertical takeoff and landing UAV composed of electric power system. The main system includes power motor, power supply, ESC, and propeller blades.

(1) Battery

One smart battery, provides power for flight control system, fix-wing system, rotor-wing system.

(2) Power motor

Fix-wing motor: provide power for cruise.

Rotor wing motor: provide power for take-off and landing.

(3) Electrically controlled system (ESC)

Adjust the motor speed based on the electrical signal.

(4) Propeller

Tail paddle: 16 × 10, 16 is diameter, 10 is screw pitch.

Rotor-wing blade: 16 × 6, 16 is diameter, 6 is screw pitch.

For plateau area, it's recommended to use 17 ×12 tail paddle and 16 × 8 rotor-wing blades.

2. 4 Payload

P330 supports two types of camera, orthophoto camera and oblique camera.
Orthophoto camera is used for geographic mapping, oblique camera is used for 3D modeling.
Supported orthophoto camera: HC15, Sony α7RII.
Supported oblique camera: HC-D2, HC-DG3.

Orthophoto camera:

Camera model	HC15	Sony α7RII
Picture		
Sensor size	35. 9mm*24mm	35. 9mm*24mm
Pixel	42 MP	42 MP
Focal length	35 mm	35 mm
Storage	128G	64G
Weight	400g	582g

2. 5 Smart battery



The drone power system is using one smart battery to provide power for the flight control system. The battery has big capacity (27Ah), and the full charge voltage is 50.4V. The battery must be charged with the standard charger in P330 Pro product package, and each flight needs a full smart battery.

***Note**: If you need detailed description of smart battery, please refer to the appendix of 'HC Smart Battery Guide'.*

3 Hardware setup

3.1 Base setup



The base station is working as a communication intermediary between drone and the ground control software.
The communication between base station and drone is by the radio of base station.
The communication between base station and ground control software (windows application) is by the Wi-Fi of base station.

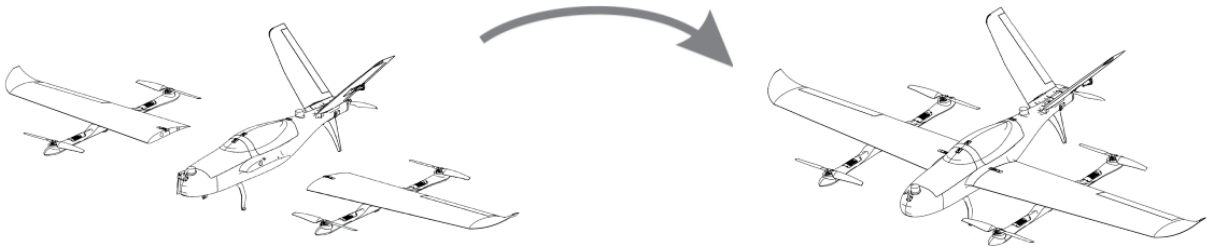
Tripod setup：

On known point, users need to use a tripod with tribrach.
Fix the base station on the tribrach, centering and leveling.
Connect the whip antenna to base station, then turn on receiver.

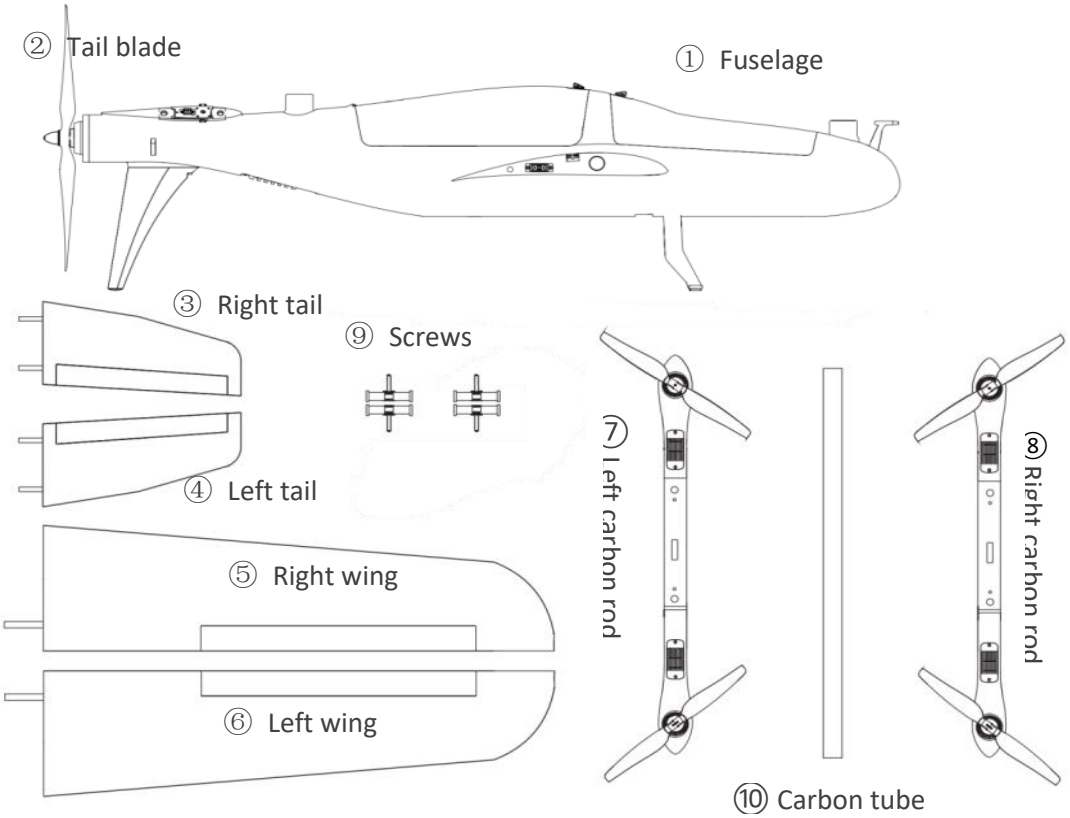
On unknown point, users can fix the base station on the tripod, adjust the tripod to make it stable.
Connect the whip antenna to base station, then turn on receiver.

***Note**: please set up the base in an open area and set up the whip antenna on a higher place.*

3.2 Assembly of P330

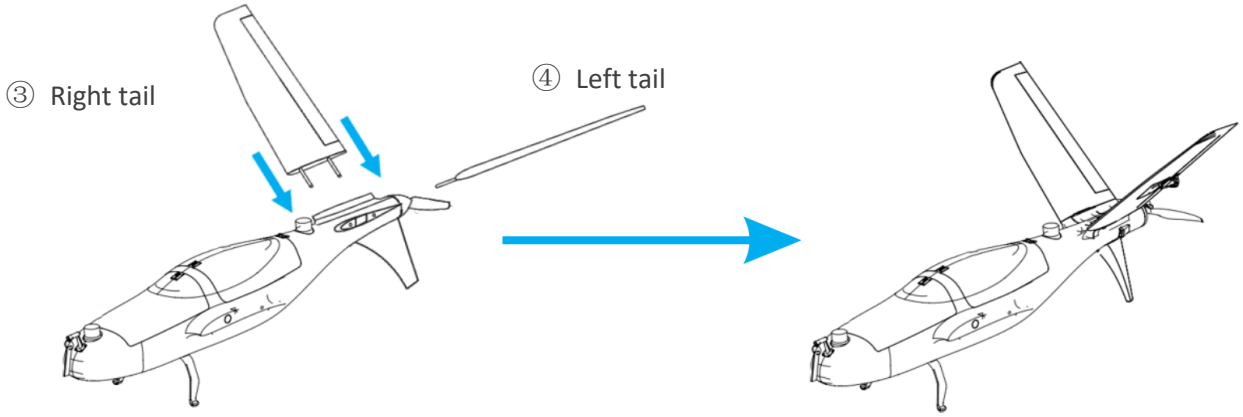


(1) The drone is with modular design, which makes it easy for transportation, disassemble and assemble. As shown below:

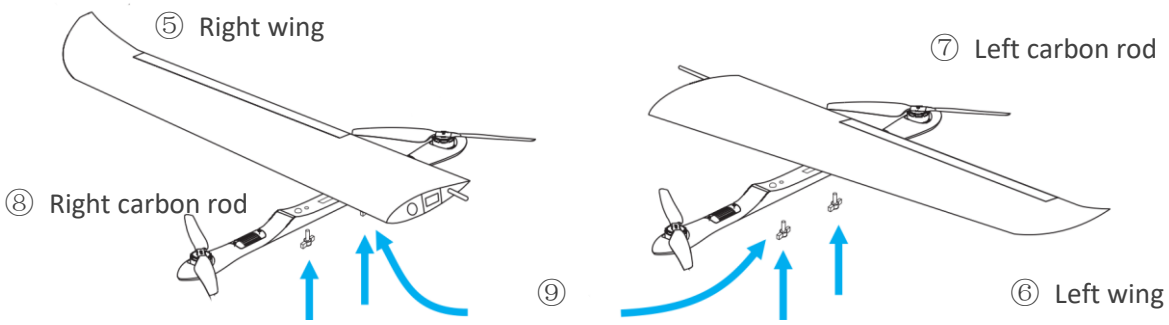


According to the package list, check all parts of the drone to make sure that each part is in good condition.

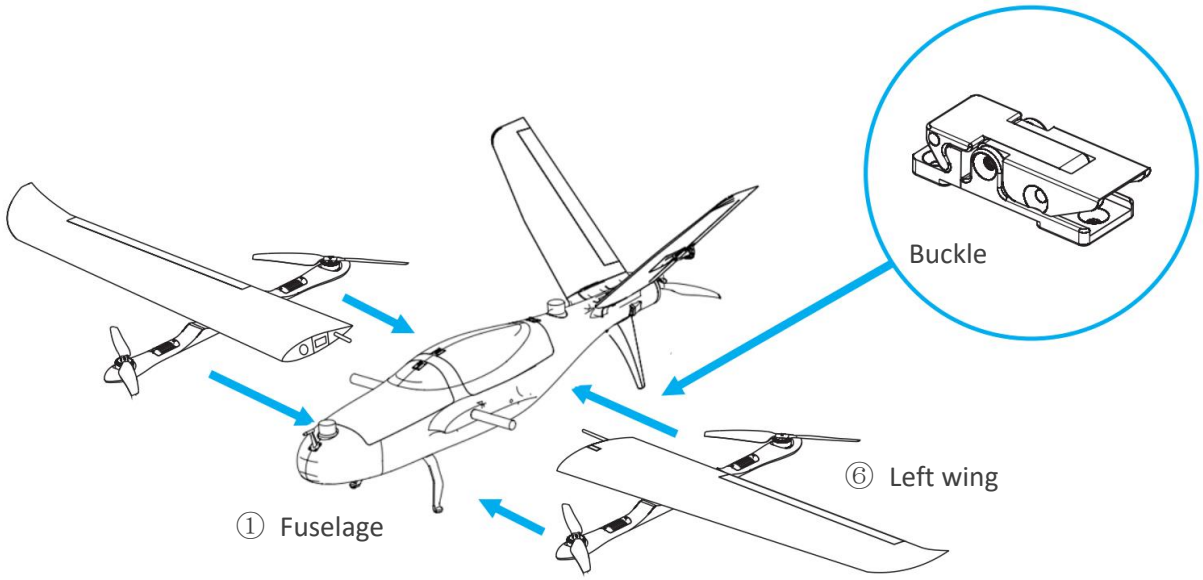
Next, assemble each part as following pictures show.



Press the buckle on the fuselage, plug in the right/left tail, then release the buckle to lock.



Attach the left carbon rod to the left wing, and use the screws to the fix carbon rod to the wing. Same for right carbon rod and right wing.

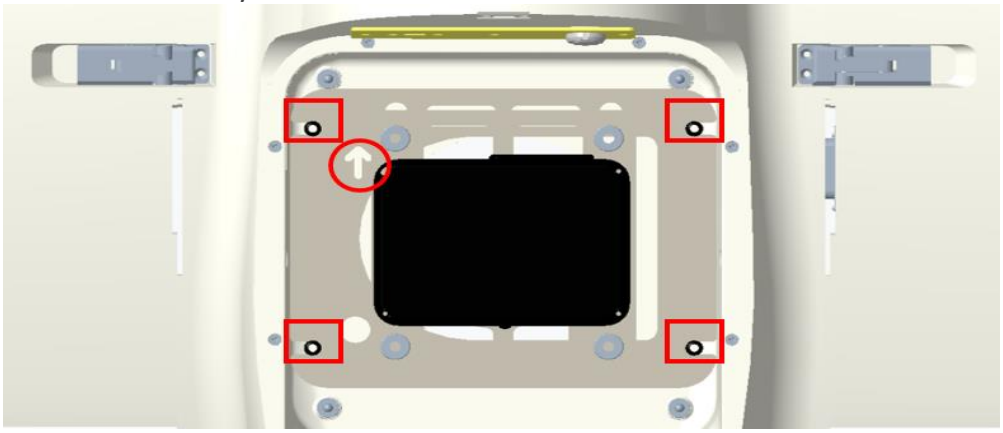


Insert the shaft carbon tube into the fuselage.
Assemble the left wings to the fuselage through the carbon tube, connect the cables between the left wing and fuselage (insert the cable/connector into the compartment of the wing).
Insert the carbon rod of left wing to the fuselage, and lock the buckle. Same operation for the right wings.

3.3 Camera installation

3.3.1 Installation of HC15

Fit the HC15 camera into the mount plate, than fix the mount plate into the drone.
Please make sure that mount plate is fit into the four holders.
Please make sure the led of the camera is facing the head of the drone.
Connect the camera to drone by the connection cable.



3.3.1 Installation of Sony α 7RII




Connect the camera Y cable to the camera via event connector and shutter connector.



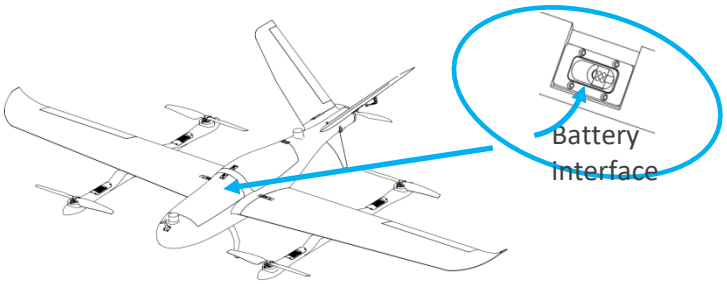

Take the mount plate out, mount the camera to the mount plate and fix the screw.




Remove the lens cap and turn on camera.
Fix the camera with mount plat in the drone compartment, and connect to drone by the Y cable.
Close the compartment cover and lock.

***Note**: please make sure that the camera battery is fully charged, and SD card has enough space for required mission flights.*

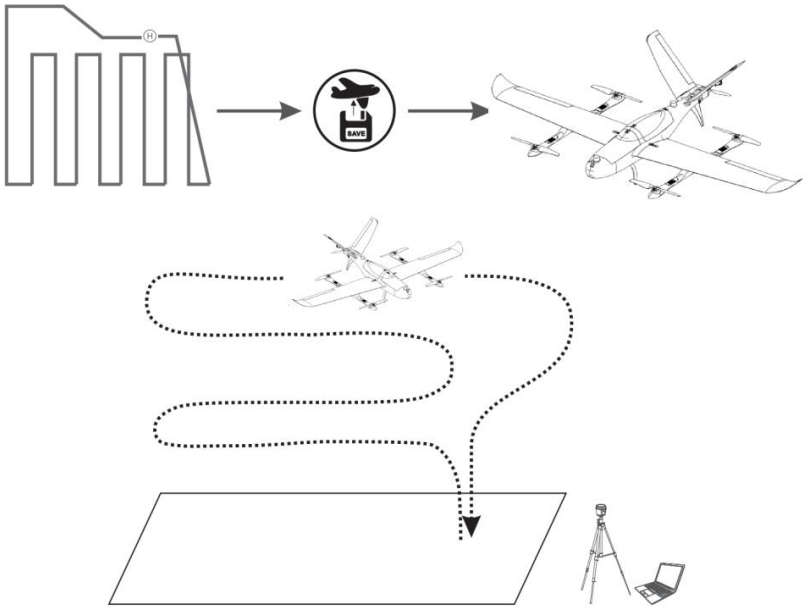
3. 4 Drone battery installation





Remove the battery cover on the front of the fuselage.
Input the smart battery, please note the polarity on the connector. After connection, there will be a beep from the drone which indicates the drone is on.

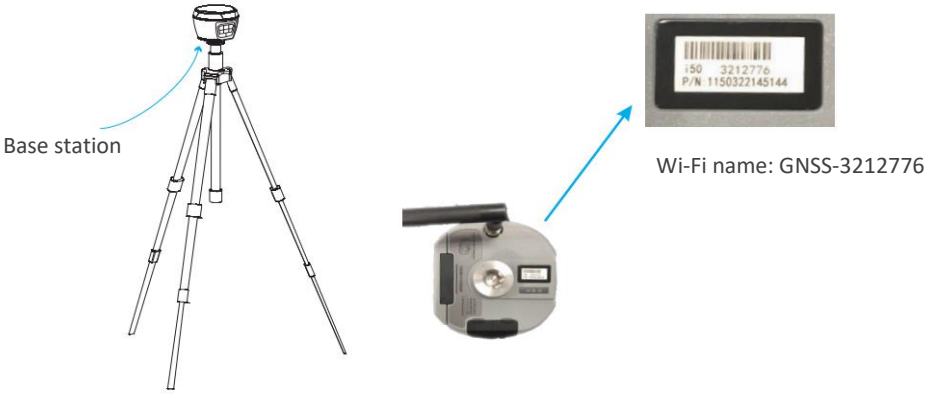
4 Mission plan



The CHCNAV EasyFly is a mission plan software designed for P330 Pro, which can run on any windows PC/laptop. Please contact support@chcnav.com for the installation package.

4.1 Connection

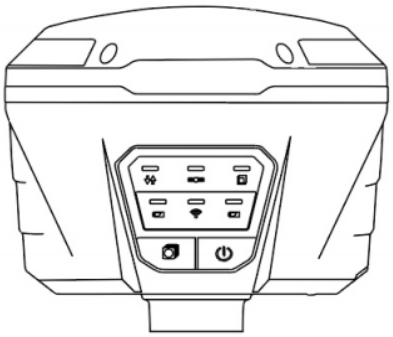
Make sure the base station is on, the drone is powered on.



Connect the PC/laptop to the Wi-Fi of base station, the Wi-Fi name is GNSS-********(SN), password is 12345678.

Please set up the base station on the flat ground and press the power supply for 3s. Make sure the base station is on, the drone is powered on and users are five meters away from the UAV.

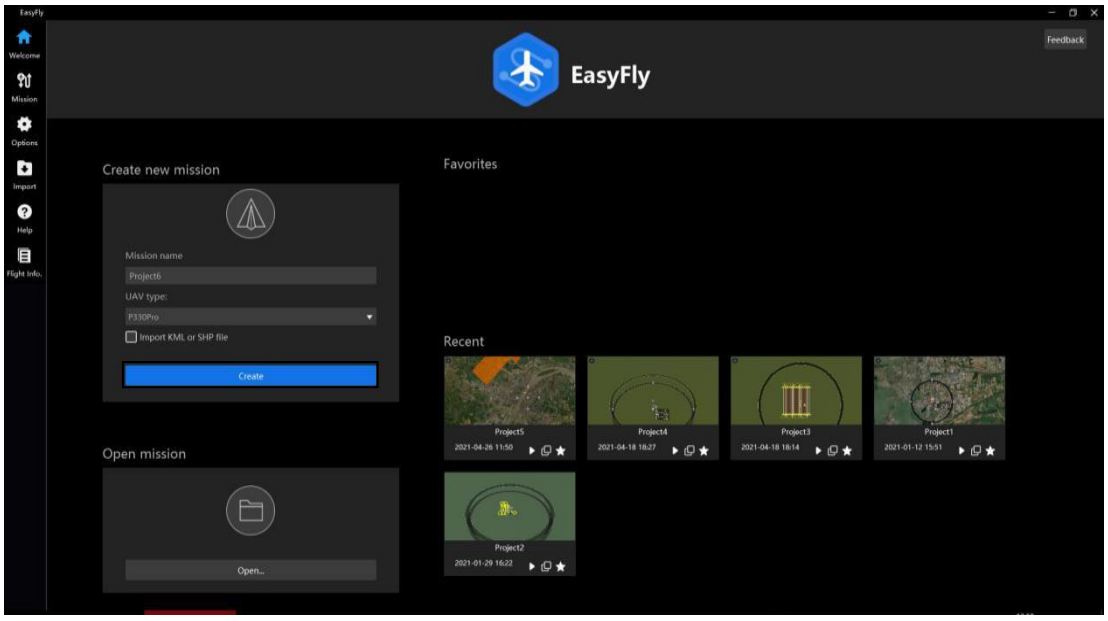
The information of base station indicators are as follows:



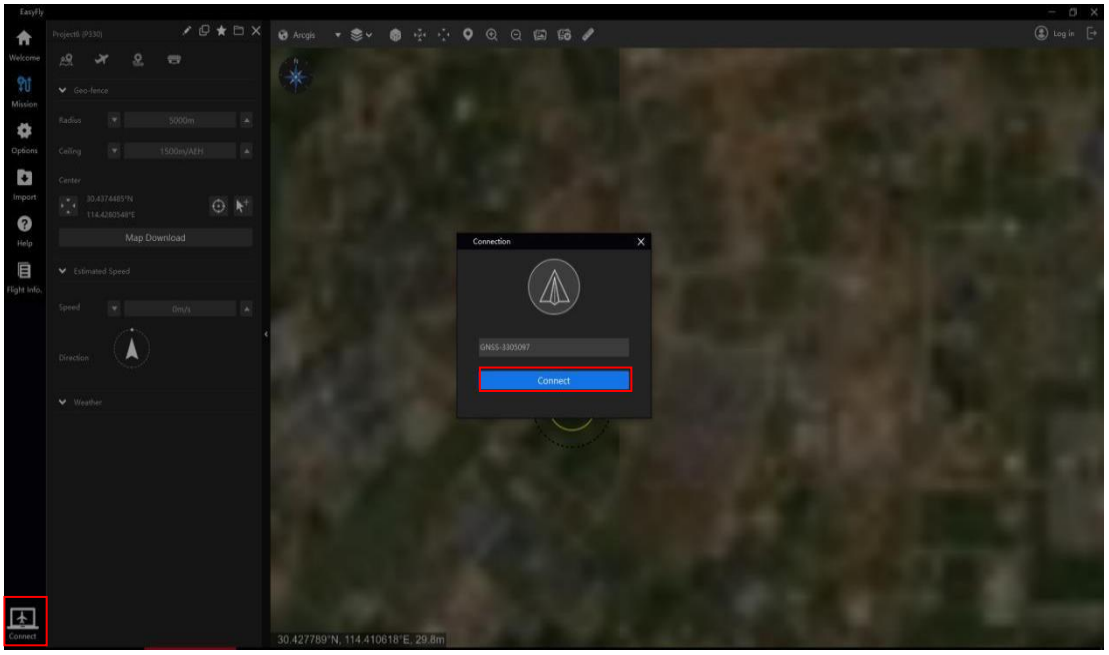
Power LED	Full: the light is on Low: the light is flashing
Signal LED	The light is yellow in base station state After receiving float signal, the light is yellow, the light turns green when the signal is fixed
Satellite LED	Blink N times every 5s, N is the number of satellites
Data LED	Yellow and flashing while collecting data
Wi-Fi LED	Orange after connecting

Run EasyFly software and click Create to create a project. After successfully connecting the UAV, the interface will obtain the current position of the UAV and the weather condition of the current position.

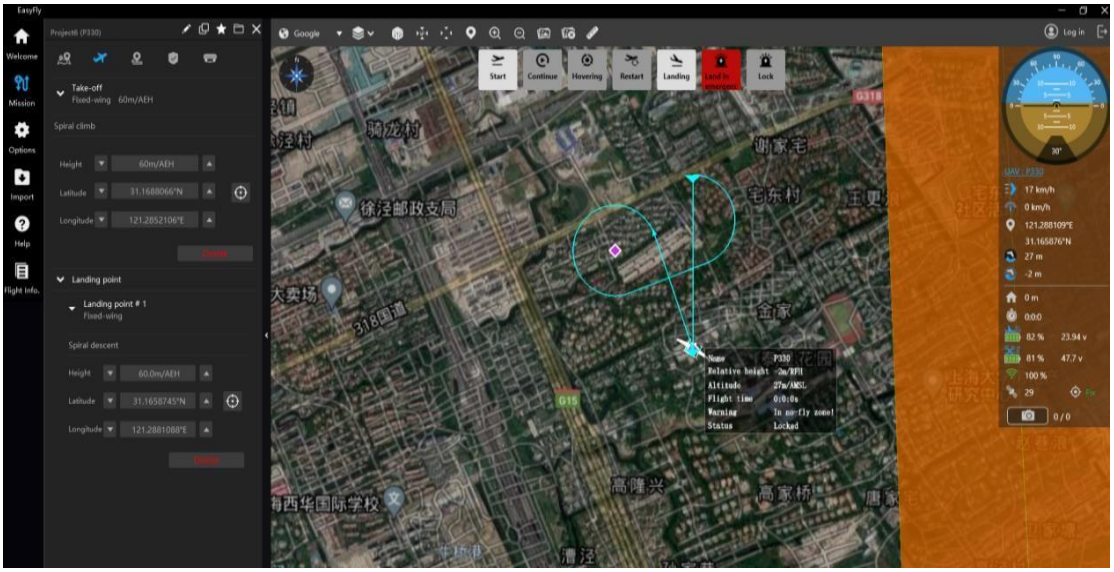
If user has pre-design KML or SHP, users can tick **Import KML or SHP file**, then the software will generate the mission based on the region.



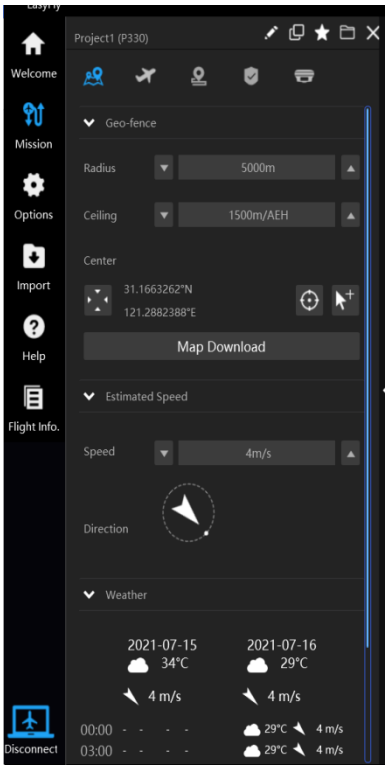
Click **Connect** at the left bottom corner, and make sure the device name is correct, then click **Connect**.


EasyFly
Welcome
Mission
Options
Import
Help
Flight Info.
Connect
Project6 (P330)
Geo-fence
Radius
5000m
Ceiling
1500m/AEH
Center
Map Download
Estimated Speed
Speed
0m/s
Direction
Weather
Arcgis
Log in
Connection
GNSS-3305097
Connect
30.427789°N, 114.410618°E, 29.8m

4.2 Create Mission



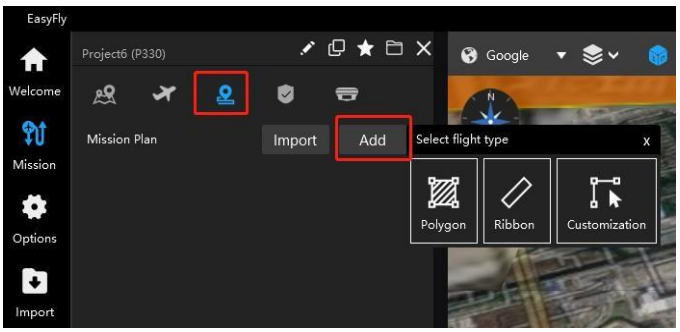
After connection, the software will generate a take-off and landing route automatically based on current position and heading.



Edit electronic fence: according to the current UAV as the center, the cylinder electronic fence is generated, its radius and height are customized according to the task requirements, and its position can be dragged by the left mouse button.

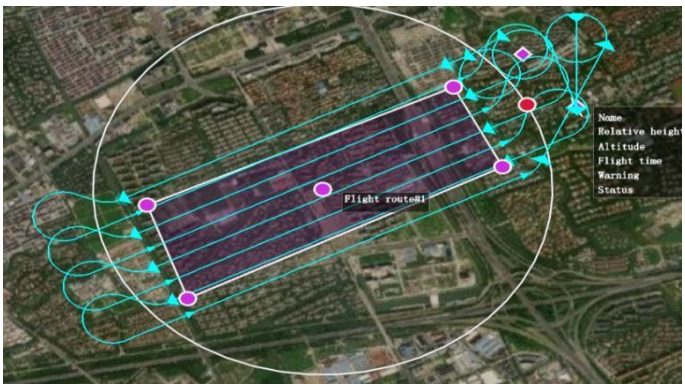
Edit take-off point: after connecting the UAV, the ground station will create a take-off point and a take-off circle point according to the location of the UAV. It is necessary to adjust the position of the take-off point according to the wind direction to make the UAV take off against the wind.

Edit landing point: after connecting the UAV, the base station will automatically create the landing point and landing circle point according to the location of the UAV. It is necessary to adjust the position of the landing point according to the wind direction to make the UAV land against the wind.

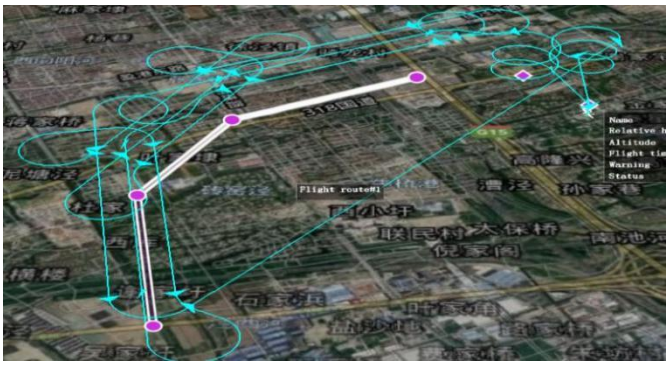


Go to mission plan, click **Add** to draw the working area.

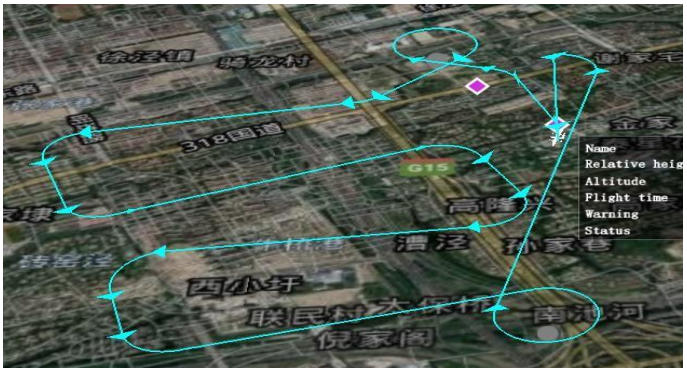
Polygon: draw a polygon working area.



Ribbon: draw a ribbon working area, as shown below:



Customization: users can define the route combined as needed.



After drawing the mission, the details will be displayed on the left.

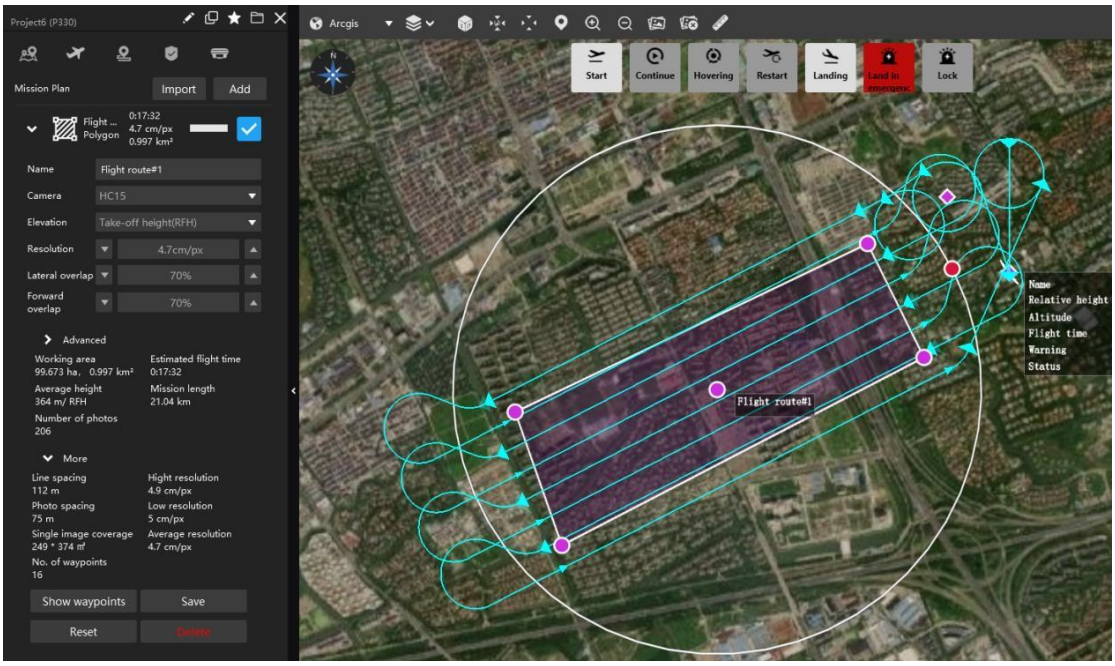
Camera: choose the camera used.

Elevation: Normally choose Take-off height (RFH)

Resolution: set as required.

Lateral overlap: set as required, 50% -70% is recommended.

Forward overlap: set as required, 60%-80% is recommended.



4. 3 Status bar



Attitude ball： Pitch angle, roll angle and heading angle.

Ground speed: speed relative to the ground.

Latitude and longitude: Longitude and latitude

Airspeed: speed relative to surrounding fluid.

Absolute height: Current position altitude

Relative height: Altitude relative to takeoff point position.

Distance from landing point: The linear distance between UAV's current position and landing point on 3D surface

Flying time: Fix-wing flying time

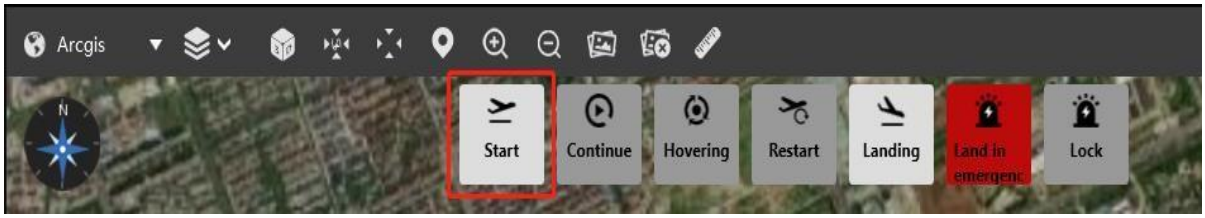
Power: the smart battery level

Signal intensity: Signal strength between UAV and base station

Number of satellites: Number of satellites searched by GPS

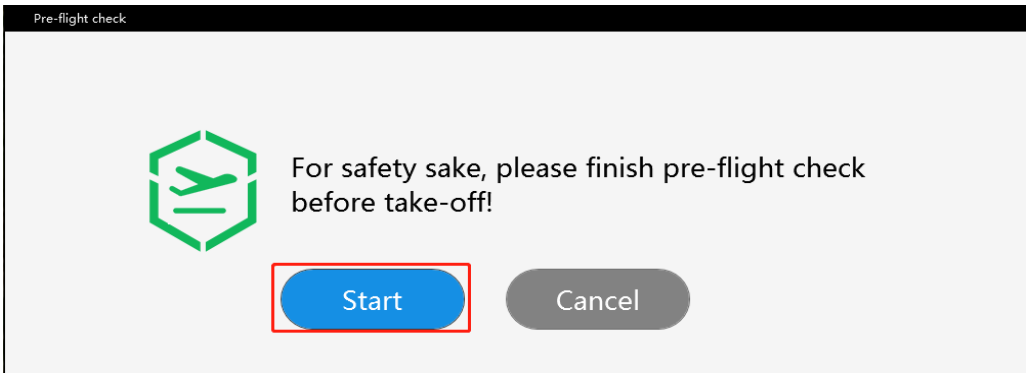
Positioning status: DGPS status

Photograph: Each click, the camera takes a picture, and the data behind represents the estimated number of photos taken / the actual number of photos taken.



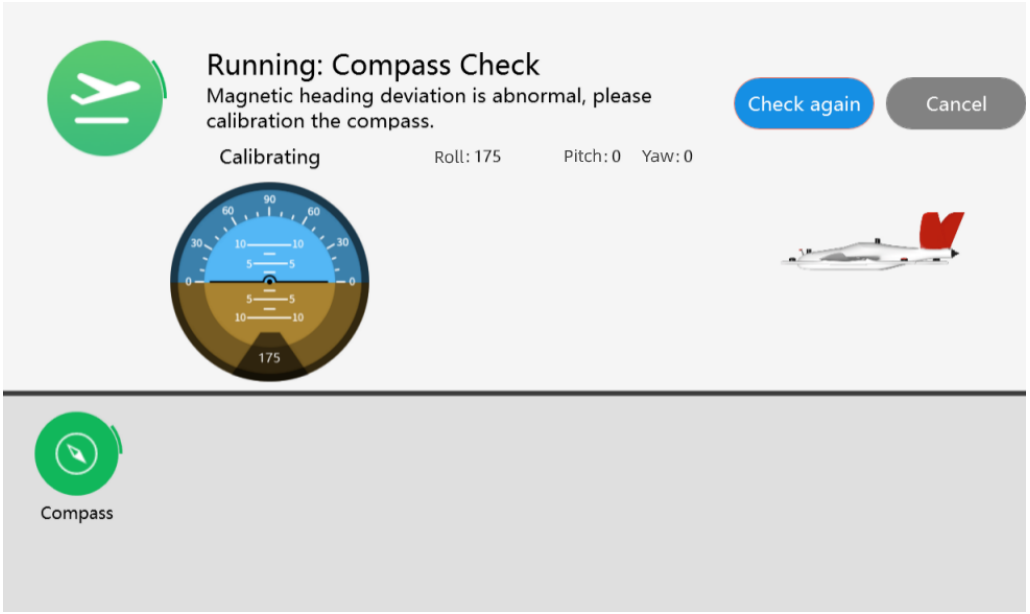
Start： Click start task to conduct UAV self check. After self pre-flight check, the UAV will operate according to the planned route until it is completed.
Continue: After clicking "reroute", the UAV will fly to the route entrance to perform the mission again. you can click "reroute"when the UAV is in the route.
Hovering: The UAV hovers around the current position, you can only click it when the UAV is in the route.
Restart: When the UAV returns to the previous waypoint to continue its mission in the route, you can click it.
Landing: After clicking it, the UAV enters the return route and landing route and lands to the previously planned landing point.
Emergency landing: Emergency switch the rotor and fly to the landing point for vertical descent with the same altitude in the rotor state
Lock: When the UAV is in rotor state, click this button, and the four rotors stop running immediately. (don’t click during UAV flighting).

5 Pre-flight Check



Then click **Start** on the top of the map view to start pre-flight check.
The software will start pre-flight automatically.

5. 1 Compass check



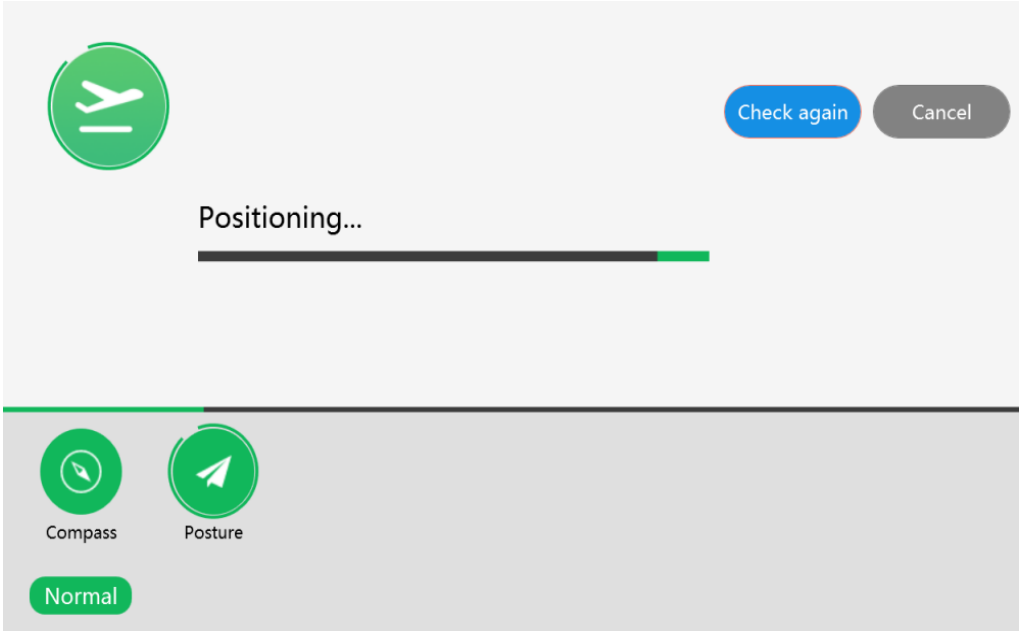
Compass: Automatically, **Normal** means passed, otherwise, users need to calibrate the compass. The process is as follows:

(1) Firstly, lift the UAV horizontally and rotate until the instrument panel can't see the pitch angle scale (displayed as sky);

(2) Then, turn the UAV to face ground and rotate horizontally until the instrument panel can't see the pitch angle scale (displayed as the ground);

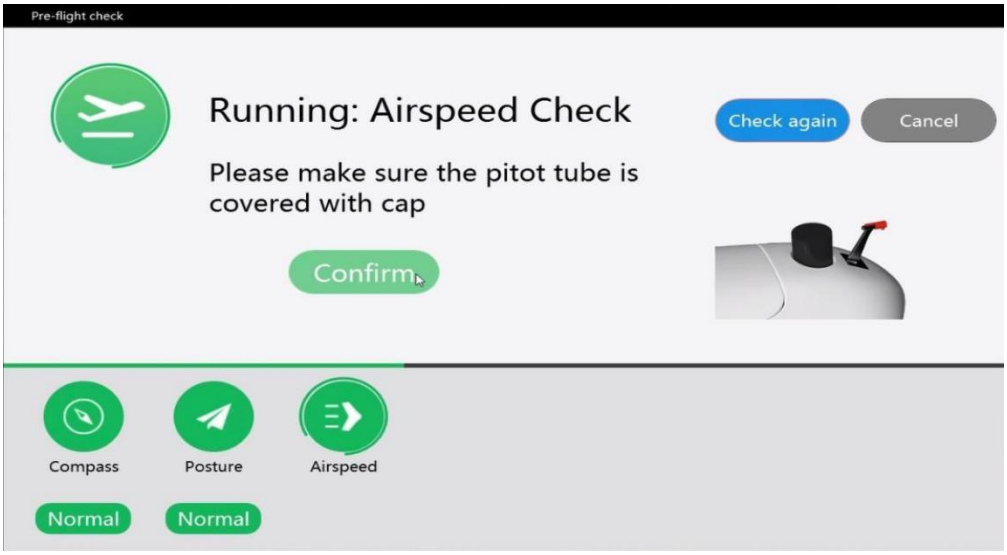
(3) Calibration complete, go to the next step directly.

5. 2 Posture check



Posture: Automatically, Normal means passed, otherwise, users need to check the RTK status and the data link between base and the drone.

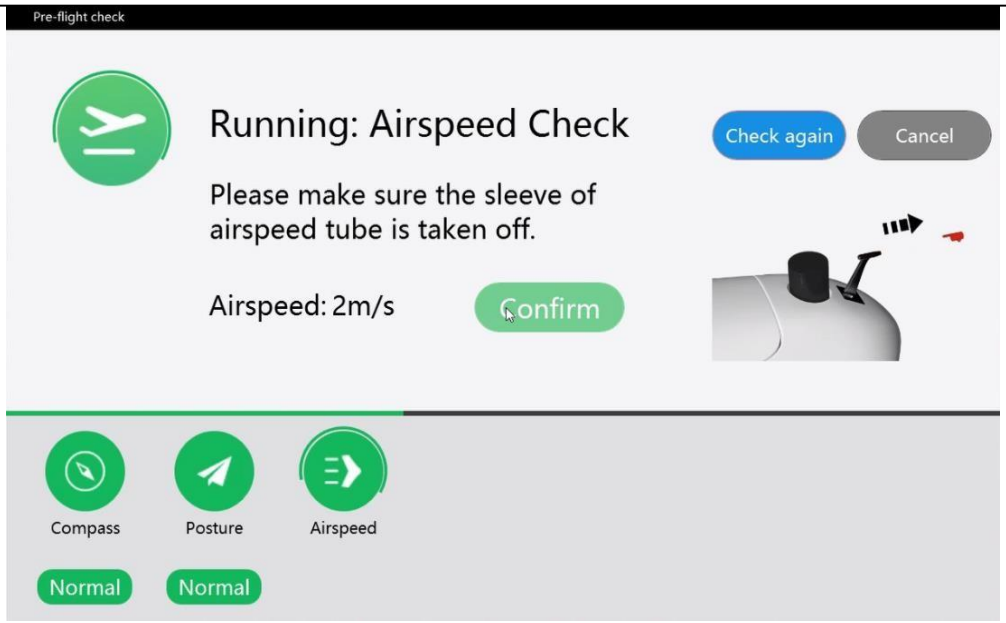
5. 3 Airspeed check



Airspeed: remove the airspeed tube cap, then click **Confirm**.

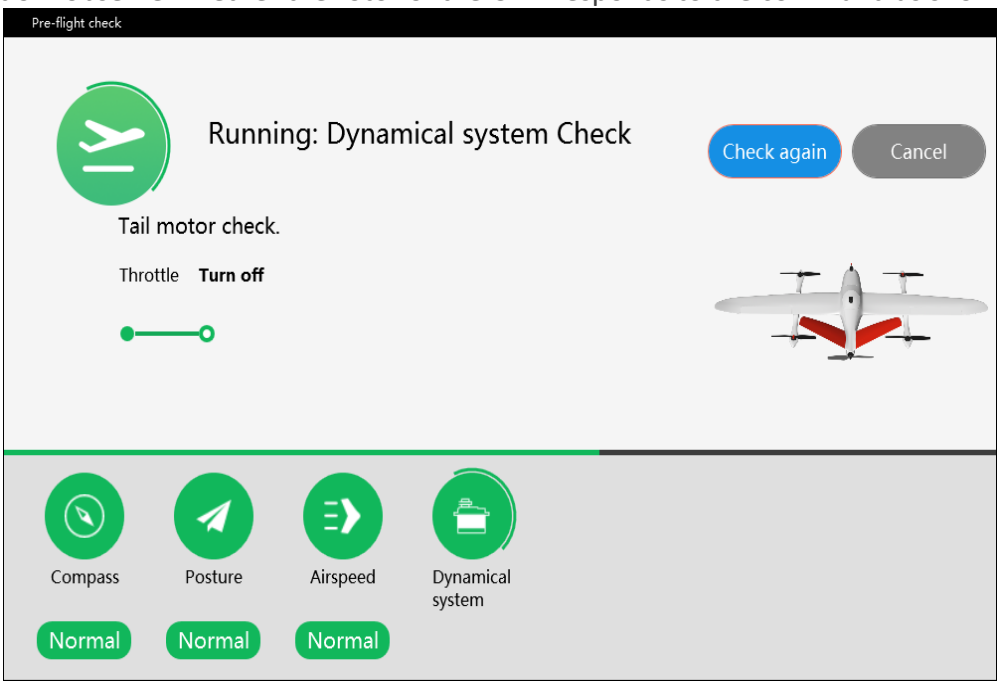
Check whether the airspeed value is normal, if it changes between -10 and 10, then click Confirm move to next step.

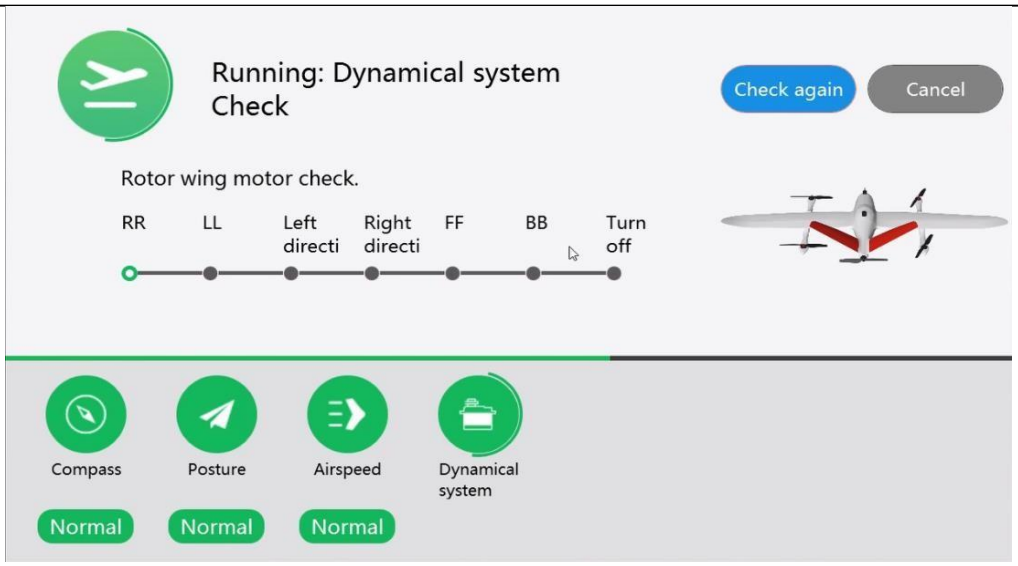
After the airspeed check, please pay attention to pulling out the airspeed tube sleeve!



5. 4 Dynamical system check

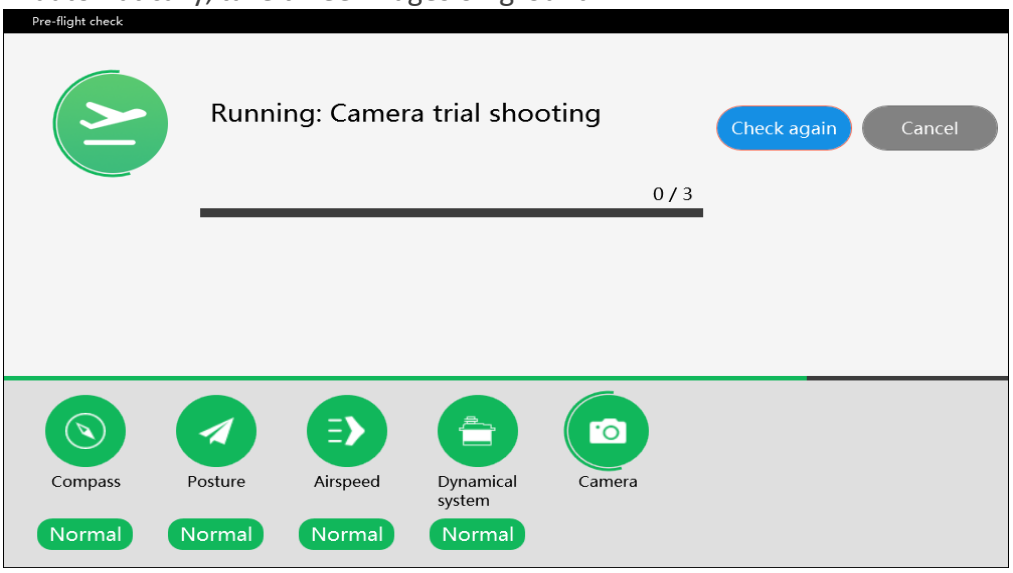
Dynamical system check: control surface inspection, throttle inspection and motor inspection.
During the inspection, the user needs to observe the response of the UAV to each command to see whether it is correct.
Check the control surface: observe whether the control surface of the UAV responds to the command as shown in the figure.
Throttle check: observe whether the tail push of the UAV responds to the command as shown in the figure.
Motor inspection: observe whether the rotor of the UAV responds to the command as shown in the figure.



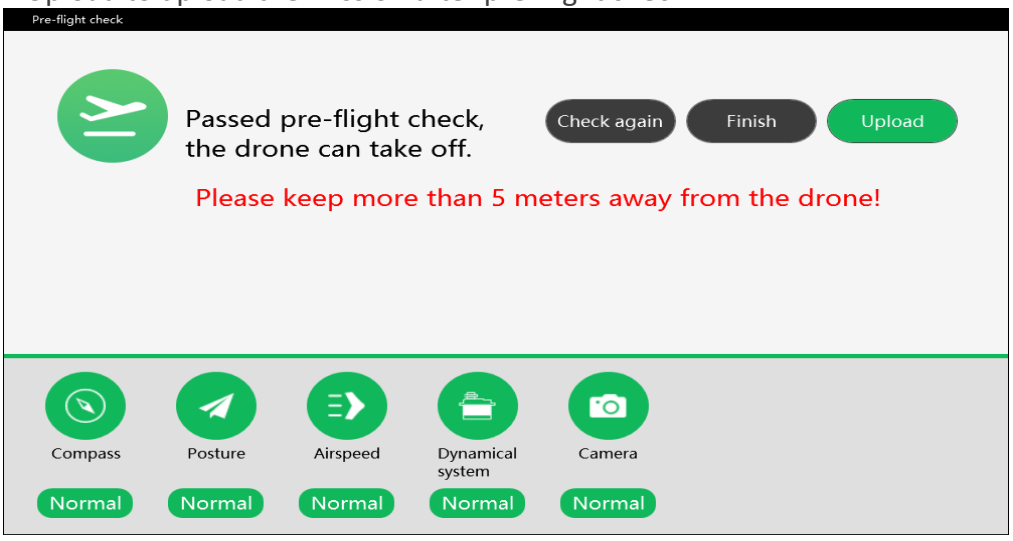


5. 5 Camera check

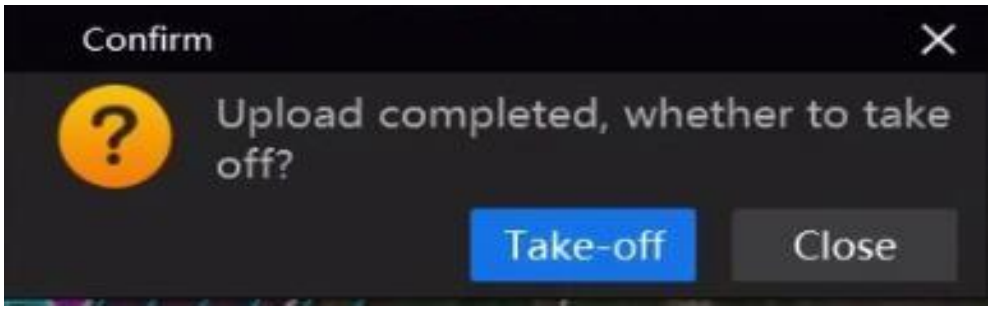
Camera check: automatically, take three images on ground.



Upload: click Upload to upload the mission after pre-flight check.



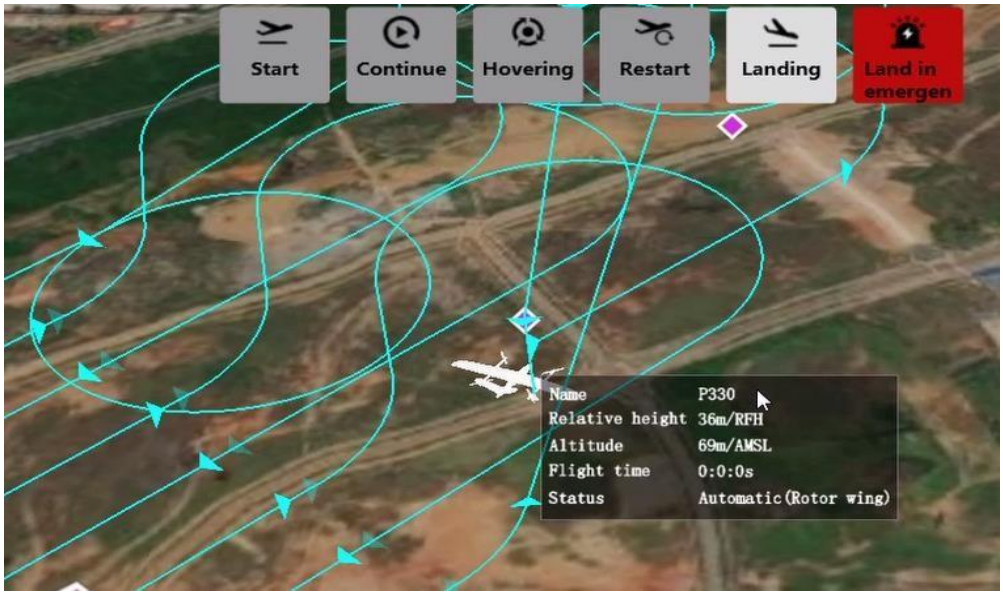
Take-off: click take-off to start the mission.



5. 6 Start flight

After click Take-off, the drone will start take off vertically, after reaching the designed take-off height, the power system will start transition to tail motor. The drone starts moving forward and climbing to designed height, then start the mission.

(1) Taking off vertically



(2) Transition and hovering to climb.



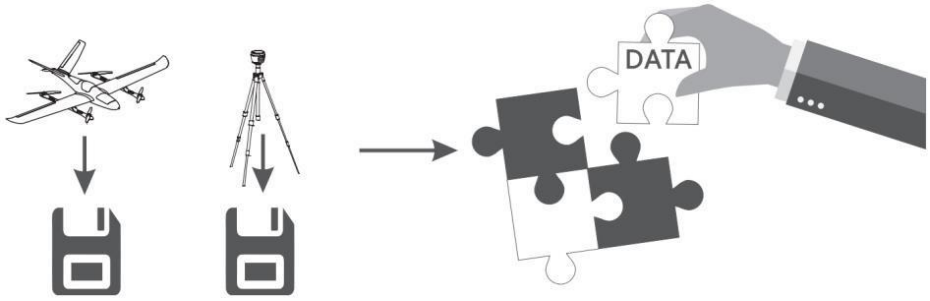
(3) Enter mission route and start collection.



(4) Finish the mission, back to landing point.



6 High-precision POS solution



6. 1 Raw data preparation

The POS post processing needs three raw files, as shown below:

3251279313D	2021/7/16 1:48	HCN 文件	7,372 KB
20210716011839.gilc	2017/1/1 0:00	GILC 文件	4,685 KB
20210716011839	2017/1/1 0:00	HCN 文件	3,573 KB

(1) The first **. HCN** data is the static data downloaded from the ground base station i50. Users can access to the Web of the receiver to download.



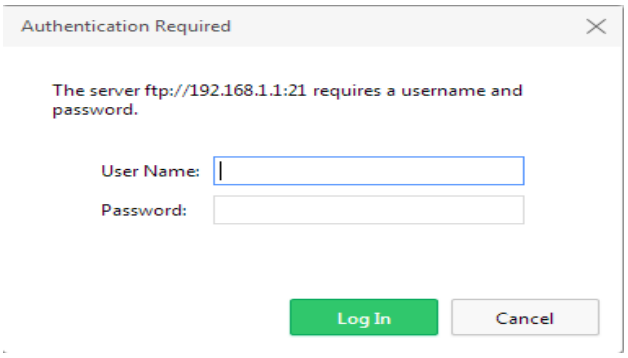
Enter the IP address (192. 168. 1. 1) of the receiver into the web browser, then it will prompt to enter Login account and password.

The default login information is: Login

Account: admin Password: password

Then click **Login**.

After logging in the web, go to Data Recording -> Data Download, it will prompt to enter a user name and password:



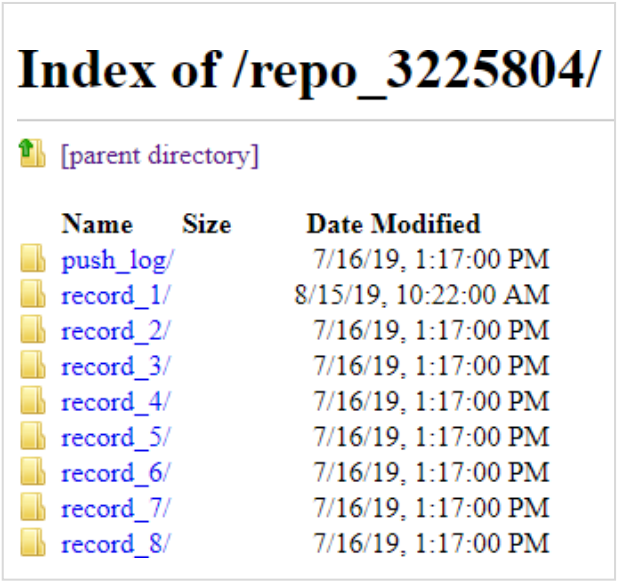
The default login information is:

User Name: ftp

Password: ftp

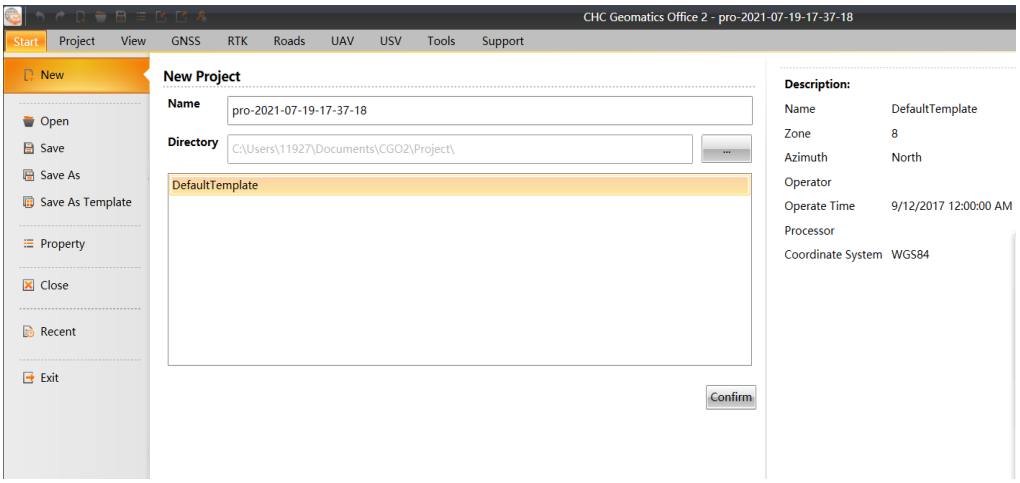
Then click **Log in**.

Then go to repo->record_1-> select the data of the recorded file-> select HCN folder, then select the target file to download.

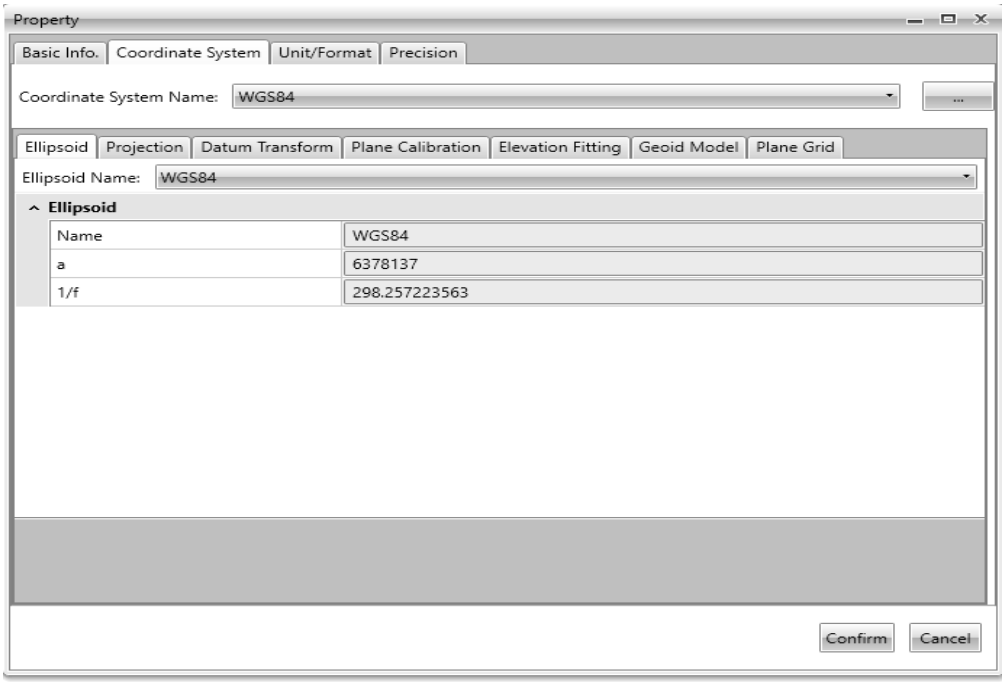


(2) **The second . HCN** and **.GILC** files are the original POS information downloaded from the drone by USB connection. They are located in the folder named with the date and time.

6. 2 Post Processing

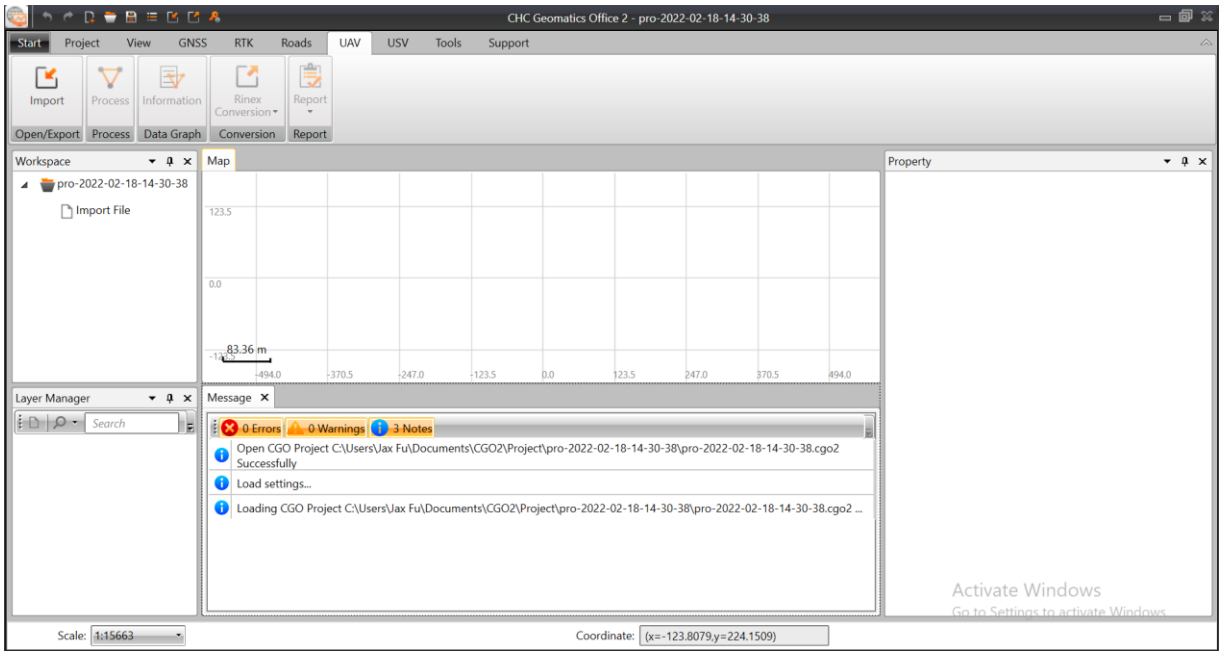


Run CGO 2, click **Start** -> **New**, and input the project name, select the directory. Then click **Confirm**.



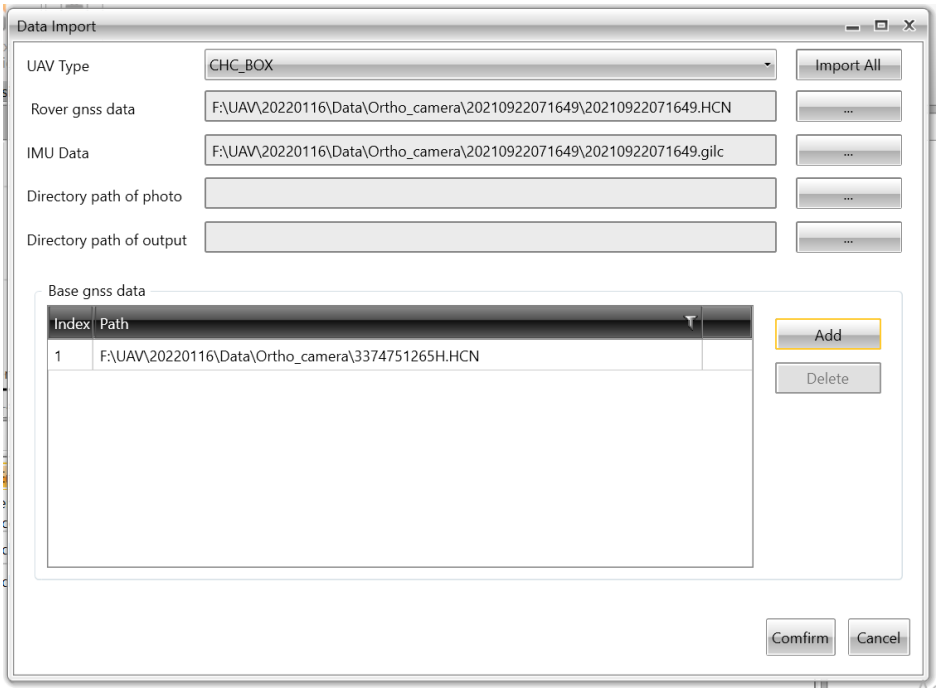
Change the properties of the project: select local coordinate system to be same as that of ground control point. The central meridian is the local central meridian of the survey area. After completing the modification, click **Confirm**.

Import data



Click **UAV** in the menu bar and click **Import**.

(1) Choose **CHC_BOX** for UAV type,



(2) Import All: click **Import All** and select the folder with the original data to import all the data,

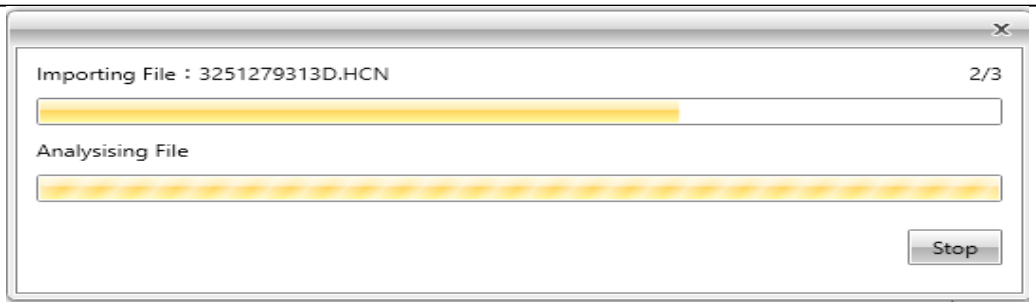
(3) Import separately

Import the rover GNSS data: Click to find the drone GNSS data, the suffix is . HCN.

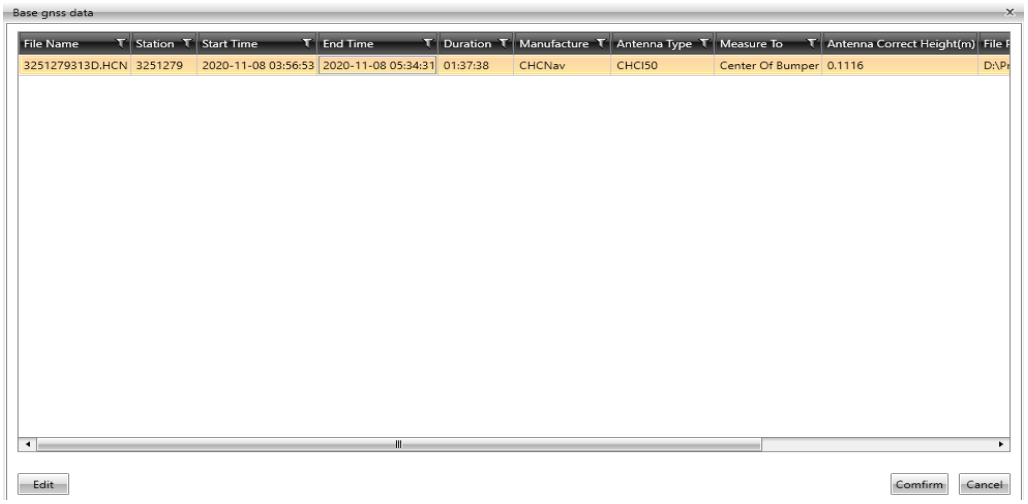
Import IMU data: Click to find the drone POS data, the suffix is .gilc.

Import base station data: Click Add, select the base station file, suffix Named . HCN.

(4) After completing the data import, click **Confirm**.

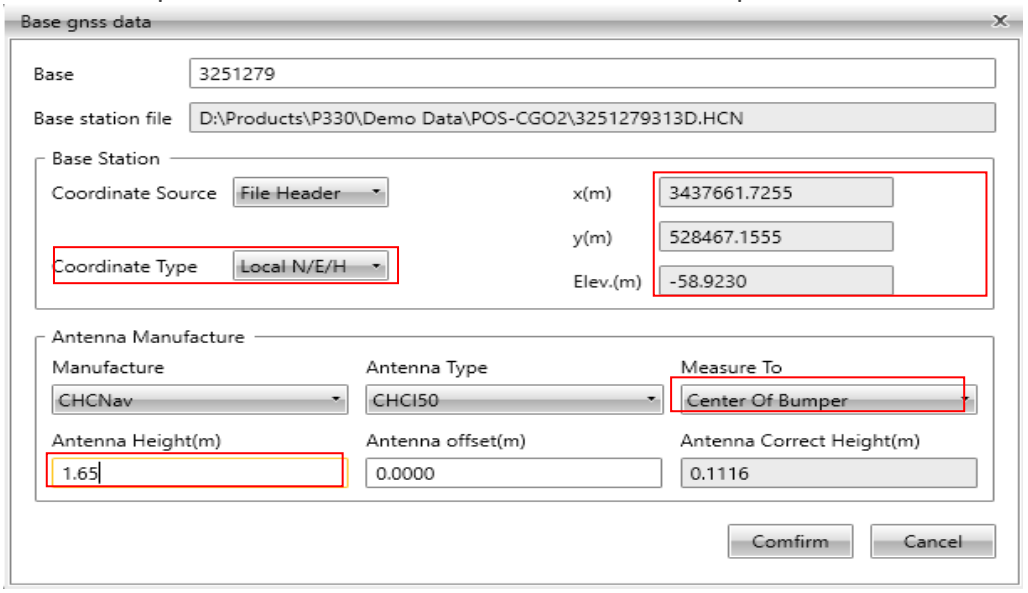


Data is being imported.



(1) After importing, check whether the relevant parameters of the base station are correct. If not, please click **Edit** to modify. Then click **Confirm**.

(2) If users need to perform the PPK calculation on a the known point of the base station, click **Edit**.



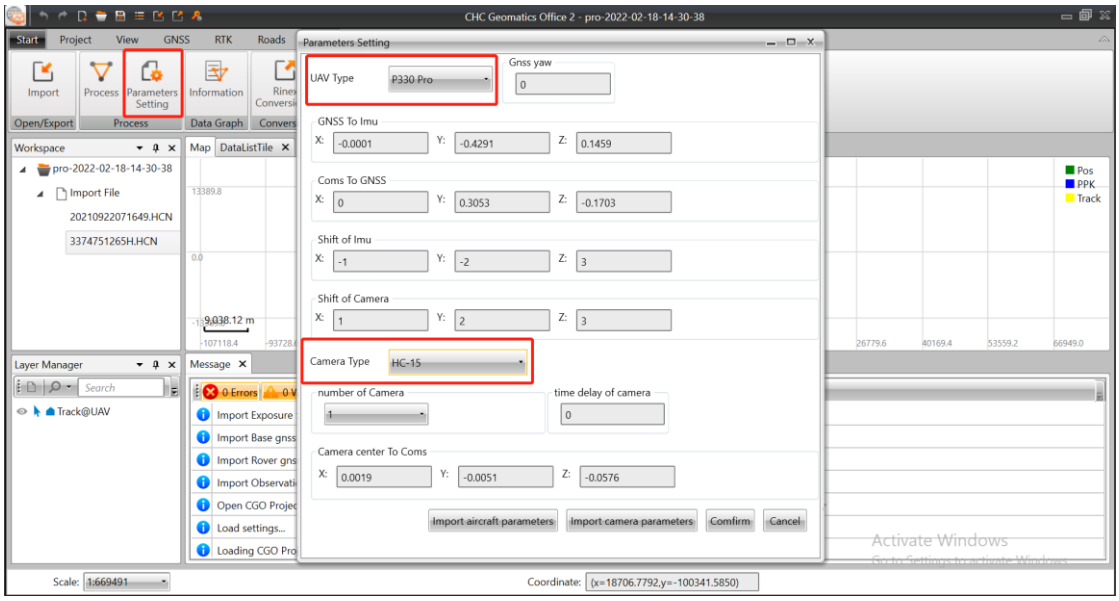
Select the type of base station coordinates.

Enter the base station coordinates manually.

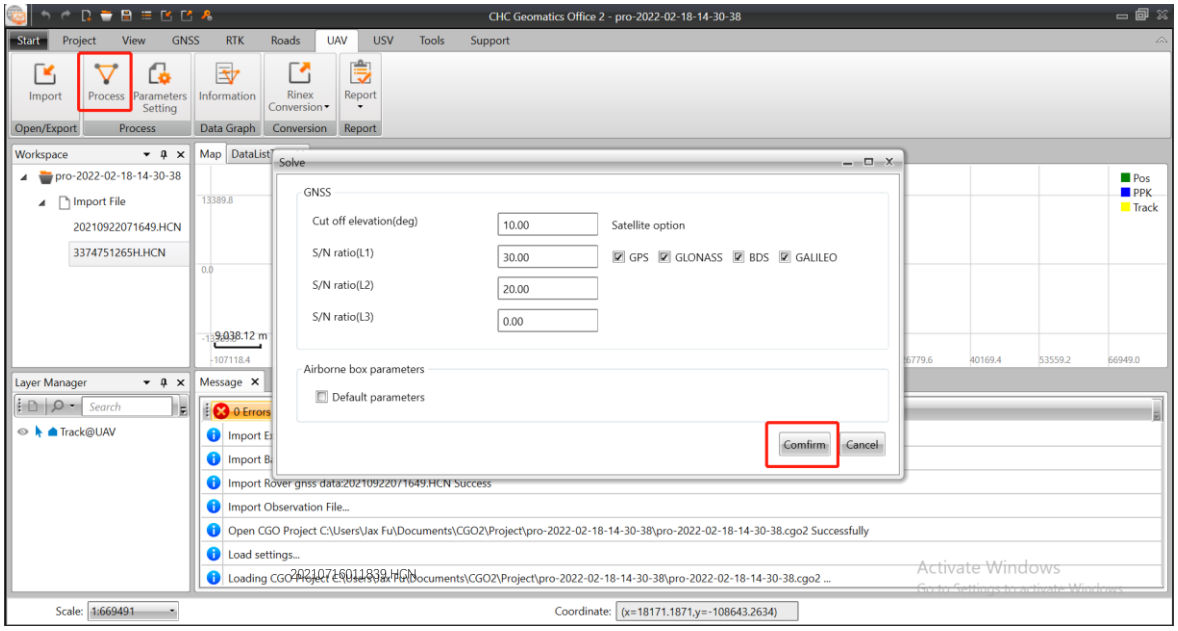
Choose the method of antenna height measurement: generally it's slant height, which is Center of Bumper. Input antenna height.

Then click **Confirm**.

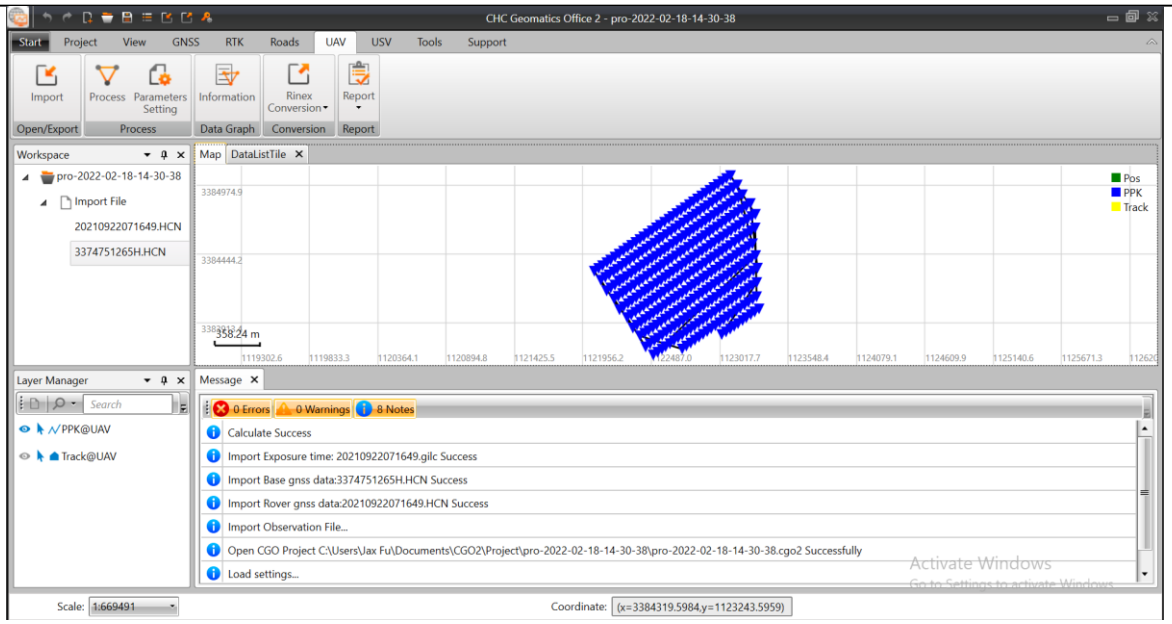
After data importing, click **Parameter Settings**, then choose correct UAV type & camera type. Finally, click confirm.



Next, click **Process** to start POS processing. Keep settings as default and just click **Confirm**.



After processing, the POS in the Map will become blue and POS file will be saved automatically on configured path. User can also click **Report** to view details.

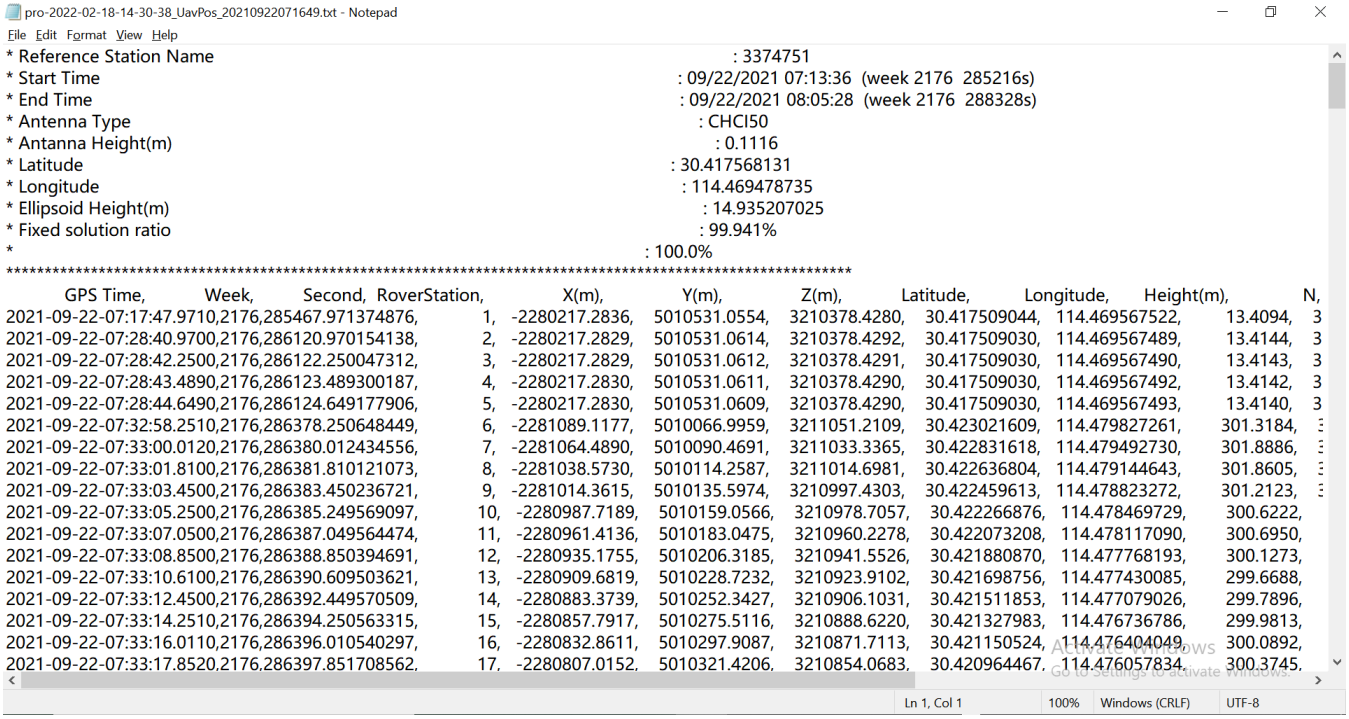


In the report, we can check the pass rate of fixed solution and POS, which can meet the requirements if the pass rate is above 85%

(1) Report of POS: report of all POS in last flight.

(2) Report of pos in sky: report of POS after drone starts the mission, which means the tested POS taken when the drone is on the ground won't be exported.

(3) Report of Track: report of the trajectory. A sample report of POS is as shown below:



pro-2022-02-18-14-30-38_UavPos_20210922071649.txt - Notepad

File Edit Format View Help

```
* Reference Station Name                                  : 3374751
* Start Time                                             : 09/22/2021 07:13:36  (week 2176  285216s)
* End Time                                               : 09/22/2021 08:05:28  (week 2176  288328s)
* Antenna Type                                           : CHCI50
* Antanna Height(m)                                      : 0.1116
* Latitude                                               : 30.417568131
* Longitude                                              : 114.469478735
* Ellipsoid Height(m)                                    : 14.935207025
* Fixed solution ratio                                   : 99.941%
*                                                       : 100.0%
*************************************************************************************************************
      GPS Time,        Week,      Second, RoverStation,        X(m),        Y(m),        Z(m),     Latitude,     Longitude,   Height(m),          N,
2021-09-22-07:17:47.9710,2176,285467.971374876,    1, -2280217.2836, 5010531.0554, 3210378.4280, 30.417509044, 114.469567522,  13.4094,  3
2021-09-22-07:28:40.9700,2176,286120.970154138,    2, -2280217.2829, 5010531.0614, 3210378.4292, 30.417509030, 114.469567489,  13.4144,  3
2021-09-22-07:28:42.2500,2176,286122.250047312,    3, -2280217.2829, 5010531.0612, 3210378.4291, 30.417509030, 114.469567490,  13.4143,  3
2021-09-22-07:28:43.4890,2176,286123.489300187,    4, -2280217.2830, 5010531.0611, 3210378.4290, 30.417509030, 114.469567492,  13.4142,  3
2021-09-22-07:28:44.6490,2176,286124.649177906,    5, -2280217.2830, 5010531.0609, 3210378.4290, 30.417509030, 114.469567493,  13.4140,  3
2021-09-22-07:32:58.2510,2176,286378.250648449,    6, -2281089.1177, 5010066.9959, 3211051.2109, 30.423021609, 114.479827261, 301.3184,  3
2021-09-22-07:33:00.0120,2176,286380.012434556,    7, -2281064.4890, 5010090.4691, 3211033.3365, 30.422831618, 114.479492730, 301.8886,  3
2021-09-22-07:33:01.8100,2176,286381.810121073,    8, -2281038.5730, 5010114.2587, 3211014.6981, 30.422636804, 114.479144643, 301.8605,  3
2021-09-22-07:33:03.4500,2176,286383.450236721,    9, -2281014.3615, 5010135.5974, 3210997.4303, 30.422459613, 114.478823272, 301.2123,  3
2021-09-22-07:33:05.2500,2176,286385.249569097,   10, -2280987.7189, 5010159.0566, 3210978.7057, 30.422266876, 114.478469729, 300.6222,
2021-09-22-07:33:07.0500,2176,286387.049564474,   11, -2280961.4136, 5010183.0475, 3210960.2278, 30.422073208, 114.478117090, 300.6950,
2021-09-22-07:33:08.8500,2176,286388.850394691,   12, -2280935.1755, 5010206.3185, 3210941.5526, 30.421880870, 114.477768193, 300.1273,
2021-09-22-07:33:10.6100,2176,286390.609503621,   13, -2280909.6819, 5010228.7232, 3210923.9102, 30.421698756, 114.477430085, 299.6688,
2021-09-22-07:33:12.4500,2176,286392.449570509,   14, -2280883.3739, 5010252.3427, 3210906.1031, 30.421511853, 114.477079026, 299.7896,
2021-09-22-07:33:14.2510,2176,286394.250563315,   15, -2280857.7917, 5010275.5116, 3210888.6220, 30.421327983, 114.476736786, 299.9813,
2021-09-22-07:33:16.0110,2176,286396.010540297,   16, -2280832.8611, 5010297.9087, 3210871.7113, 30.421150524, 114.476404049, 300.0892,
2021-09-22-07:33:17.8520,2176,286397.851708562,   17, -2280807.0152, 5010321.4206, 3210854.0683, 30.420964467, 114.476057834, 300.3745,
```

Ln 1, Col 1 | 100% | Windows (CRLF) | UTF-8

The report can be found in the CGO project/UAV/Reports.

The images taken are not tagged with geodetic coordinates, we need to tag it with the POS data in a 3rd party software, for example PIX4D. Here, the report of the POS contains many information, which is not compatible by the 3rd party software, we need to modify it manually.

For the report, it's recommended to generate Report of POS. Find the report, copy and paste, rename it to be . csv.

Check the POS number and images number, it should be the same.

Rename the name of POS to be the same name of the first image. Use the excel function to rename all POS to be paired with all images.

7 Safety Information

7. 1 Site selection

1. Please conduct to conduct flight tests in an open field away from the crowd without obstacles.
2. Please conduct flight test within the suitable altitude specified by UAV.
3. Please conduct flight test within a suitable ambient temperature that the drone can withstand.
4. Please conduct flight test under good weather conditions, and do not fly in extreme weather such as heavy wind and heavy rain.
5. Please conduct flight test far away from scientific research institutes, military factories and other state secret units to prevent a series of serious problems.
6. Please do not fly in any no-fly areas such as airports and stations to prevent a series of serious problems.
7. Please fly in the legal airspace.

No-fly zone

According to the regulations of the International Civil Aviation Organization (ICAO) and national air traffic control on airspace control and the regulations on the management of UAV, UAV must fly in the specified airspace. For the sake of safety and responsibility, P330 Pro adds special area flight restriction function to help users use p330pro UAV products more safely and legally. Users can not plan routes and flight operations in the no-fly zone. If customers need to operate in the no-fly zone, they need to apply for the flight demand in the zone, and then contact the customer service of CHCNAV to lift the no-fly restriction in the zone.

7. 2 Safety check before flight

1. Please check the related items required by the UAV before flight.
2. Please check and ensure that all components can work normally, and replace devices that cannot work.
3. Please check the detachable parts of the UAV to ensure that the connections are stable.
4. Please check the wiring parts of the UAV to ensure that the wiring parts are correct and the important components such as flight control can work normally.
5. Please check the blades of the UAV, make sure there is no crack or broken part.
6. Please check the battery level of the UAV to ensure that the flight power is sufficient.
7. Please make sure that the airspeed tube is working normally, no object inside.

This check is the most basic check for the normal operation of the UAV. For more specific inspection items of the UAV, please refer to the above.

7. 3 Operation and safety precautions

1. Do not approach UAV that are already in operation. Ensure that personnel are outside the propeller's range of action to avoid unpredictable hazards.
2. Please ensure that the payload is within the allowable load.
3. Please return home promptly after the low battery warning is triggered.
4. Please do not perform flight missions after drinking or having drugs and other unconscious

conditions, and it is forbidden to take calls during the mission, any other dangerous operations are forbidden.

5. Please approach the drone after the rotors stop rotating.

6. Pilots should not stand on dangerous terrain such as high-voltage lines and be aware of bad weather.

7. Please use all kinds of tools to assemble safely, and power off the drone before touching the blade; after power on, please check the power supply status, and pay attention to the safe distance when taking off and landing.

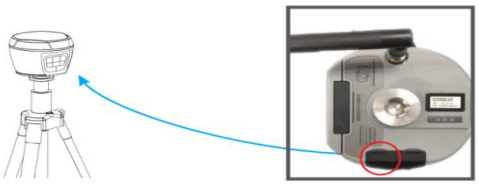
7. 4 Precautions for flight missions

1. Please pay attention to the information, such as airspeed, altitude, flight attitude, climb rate and drone power during flight.

2. In case of sudden violent wind or bad weather, please choose to return or land according to the situation.

3. If the degree of coincidence between the flight path of the drone and the pressure line of the set route is too low. Please check whether the mission planning is reasonable or whether it is high air flow.

4. When you need to download flight data, please open the soft rubber cover in the red circle in the figure below and insert it into the U disk through the conversion line. The flight data will be automatically downloaded to the REPO folder in the U root directory.



7. 5 Precautions for UAV disassembly and storage

1. Please power off the drone after landing, and check whether the drone is damaged or missing parts.

2. Please use the corresponding tool to remove the VTOL rotor and push the propeller while the power is off.

3. Please disassemble the wing after ensuring the power is off.

4. Make sure that the battery is removed before packing and storage.

7. 6 Precautions for storage and maintenance of drone

1. During storage and transportation of the drone. The battery in the drone needs to be removed to prevent danger.

2. During storage and transportation, please ensure that the motor and rudder surface are in a safe area and will not be damaged by external forces.

3. When indoors, please remove all blades of the drone to prevent unintentional injury.

4. Please replace or repair damaged blades and other items in time.

5. Please store the drone in a ventilated and dry environment with -20 ℃ ~ 40 ℃.

6. Please clean and maintain the drone after the flight.

Appendix 1 HC Smart Battery Guide

A Features of smart battery

1. LED Intelligent power indicator

This product is designed with four LED indicator lights, which can identify the charging or discharging status and display the power . When the battery is off, press the button briefly, the LED will be off after 2s.

2. Battery life display

When the battery has been used for 500 times, all the LED lights turn red, indicating that the battery life has reached the limit, users can continue to use it at their discretion.

3. Charging abnormal alarm

During charging process, the battery detect and alarm the abnormal status such as charging over-voltage, over-current, and over temperature.

4. Intelligent storage

When the battery is not in use for a long time, it will start the intelligent storage and discharge to the storage voltage to ensure the safety of battery storage.

5. Automatic sleep

When the battery is turned on and not in use, it will shut down after 3 minutes when the power is high, and when the power is low ,it will shut down after 1 minute to save the battery power.

6. Software upgrade

The battery has the function of software upgrade, which can be connected to the computer through USB port to upgrade the software and update the battery software.

7. Data communication

The battery has three communication methods: USB, GPRS and CAN. Users can use USB and WiFi to obtain the current voltage, current, battery usage and other battery information, and the control module can also establish a connection with the battery for data exchange by CAN.

8. Battery logging

The battery has a unique logging function, which can store the records of its whole use process. The battery log information includes cell voltage, current, battery temperature, cycle times, and abnormal status times, etc. Users can connect the battery through APP to view these information.

9. Voltage equalization

If there is a large voltage difference in the battery, it will automatically turn on the equalization function to keep the battery voltage difference within 20mV.

10. Heating automatically

The battery has the function of automatic heating, which can make the battery reach appropriate working temperature and give full use to the battery power performance.

11. Description of battery charging/discharging

The battery charging and discharging use one interface, the interface type is AS150U, the discharging is connected to the male end of the U, and the charging is connected to the dedicated battery charger. The charging/discharging methods are as follows:

Charging	Rapid	Constant current charging in 2C(54A) until the voltage reaches 4.2V, then constant voltage charging until the current is less than 0.02C (0. 54A)
	Quick	Constant current charging in 1C(27A) until the voltage reaches 4.2V, then constant voltage charging until the current is less than 0. 02C (0. 54A)

	Standard	Constant current charging in 0.5C (13.5A) until the voltage reaches 4.2V, then constant voltage charging until the current is less than 0. 02C (0. 54A)
Discharging	Pulse	10C (270A, the duration shall not exceed 10s)
	High magnification	5C-7C (135A-189A)
	Magnification	3C (81A)
	Standard	0. 5C (13.5A)

B Function and Description

<table>
<tr><th>Function</th><th>Description</th></tr>
<tr><td>Switch on and off</td><td>1. Switch on and off through this button and the button control the power display and communication.
（1）Switch on: Please press the button briefly, and the LED will indicate the power. Before the light goes out, press the button for more than 2s, and all the power indicator will be on. After the power on, the LED will indicate the current power;
（2）Switch off: When the battery is on, users can short press the button, and then long press the button for more than 2s, the LED indicator lights are all off, and the battery is in the off state.</td></tr>
<tr><td>LED Indicate Power level</td><td>1. The battery is designed with 4 LED lamps, which are divided into 8 grades (lighting / flashing) indicating power (capacity type)；
2. When the battery is off, if you press the button briefly, the LED will indicate the power, going out after 2s.
3. When the battery is off, charging and discharging can automatically display the power, and the LED shows the charging or discharging status.
<table>
<tr><th colspan="5">Power display</th></tr>
<tr><th>LED 1</th><th>LED 2</th><th>LED 3</th><th>LED 4</th><th>Current battery level</th></tr>
<tr><td>⊙</td><td>○</td><td>○</td><td>○</td><td>0% ～ 12%</td></tr>
<tr><td>●</td><td>○</td><td>○</td><td>○</td><td>13% ～ 25%</td></tr>
<tr><td>●</td><td>⊙</td><td>○</td><td>○</td><td>26% ～ 37%</td></tr>
<tr><td>●</td><td>●</td><td>○</td><td>○</td><td>38% ～ 50%</td></tr>
<tr><td>●</td><td>●</td><td>⊙</td><td>○</td><td>51% ～ 62%</td></tr>
<tr><td>●</td><td>●</td><td>●</td><td>○</td><td>63% ～ 75%</td></tr>
<tr><td>●</td><td>●</td><td>●</td><td>⊙</td><td>76% ～ 87%</td></tr>
<tr><td>●</td><td>●</td><td>●</td><td>●</td><td>88% ～ 100%</td></tr>
</table>
Note:
● lighting；
○ extinguishing；
⊙ flashing；</td></tr>
<tr><td>Battery life display</td><td>When the battery has been used for 500 times, all the LED lights turn red, indicating that the battery life has reached the limit, and users can continue to use it at their discretion.</td></tr>
</table>

<table>
<tr><td>Abnormal alarm</td><td>
Alarm introduction:
Buzzer and LED are used for alarm;
<table>
<tr><th colspan="6">Battery alarm display:</th></tr>
<tr><th>LED 1</th><th>LED 2</th><th>LED 3</th><th>LED 4</th><th>Indi-cate</th><th>Alarm type</th></tr>
<tr><td>○</td><td>⊙</td><td>○</td><td>○</td><td>Flash-ing</td><td>charging over-voltage</td></tr>
<tr><td>⊙</td><td>⊙</td><td>○</td><td>○</td><td>Flash-ing</td><td>over temperature</td></tr>
<tr><td>○</td><td>○</td><td>⊙</td><td>○</td><td>Flash-ing</td><td>over-current</td></tr>
</table>
Note:
○ extinguishing;
⊙ flashing;
1. charging over-voltage: When the voltage reaches 4.25V, the buzzer will give an alarm and the LED will flash; Until the voltage is lower than 4.25V, the alarm is released;
2. over temperature: When the temperature reaches 75 ℃, the buzzer will give an alarm and the LED will flash; When the temperature is lower than 65 ℃ or the charging is finished, the alarm is released
3. over-current: When the current reaches 35A, the buzzer will alarm for 10 seconds and the LED will flash; When the charging current is less than 30A, the alarm is released.
</td></tr>
<tr><td>Automatic sleep</td><td>1. When the battery is not communicating: when the voltage of the minimum single battery is greater than or equal to 3.00V, the battery will shut down after 3 minutes; When the minimum cell voltage is less than 3.00V, the battery will shut down after 1 minute;
2. When the battery is communicating: when the voltage of the minimum single battery is greater than or equal to 3.00V, the battery will not shut down; When the minimum cell voltage is less than 3.00V, the battery will shut down after 1 minute.</td></tr>
<tr><td>Software upgrade</td><td>The battery has the function of software upgrade, which can be connected to the computer through USB port to upgrade the software and update the battery software.</td></tr>
<tr><td>Data communication</td><td>The battery has three communication methods: USB, GPRS and CAN. Users can use USB and WiFi to obtain the current voltage, current, battery usage and other battery information, and the control module can also establish a connection with the battery for data exchange.</td></tr>
<tr><td>Battery logging</td><td>1. The battery has a unique logging function, which can store the records of its whole life.
2. The battery log information includes cell voltage, current, battery temperature, cycle times, and abnormal status times, etc. Users can connect the battery through APP to view these information.</td></tr>
</table>

Voltage equalization	1. When the minimum cell voltage is more than 3.0V in the charging state, this function will open, and the differential voltage of the cell can be kept within 20mV; 2. In the non charging state, the total voltage is more than (3.875 * N)V, and the minimum cell voltage is more than 3.85V. The function will open, and the differential voltage of the battery is kept within 20mV; 3. When the temperature is higher than 50 ℃, the function will be closed, and when the temperature is lower than 50 ℃, the function will be opened to keep the differential voltage within 20mV.
Heating at low temperature	1. In the power on state, long press the button until the fourth LED light is red to enter the heating mode. When the cell temperature is lower than 8 ℃, the heating function will be automatically turned on ,and when the cell temperature is higher than 12 ℃ or the battery is turned off, the function will be automatically turned off; 2. Insert it into the UAV cabin, and automatically turn on the heating mode when entering the flight mode. When the cell temperature is lower than 8 ℃, the heating function will turn on automatically, and when the cell temperature is higher than 12 ℃ or the battery is turned off, the heating function will turn off.
Function of battery discharging	1. High temperature: After 0. 5C standard charge, it was stored at 55 ± 2 ℃ for 4 hours, then discharge to 33. 6V with 0. 5C, ,capacity ≥ 95%; 2. normal temperature: After 0. 5C standard charge, it was stored at 20±5℃ for 4 hours, then discharge to 33. 6V with 0. 5C, ,capacity ≥ 98%; 3. After 0. 5C standard charge, it was stored at -20±2℃ for 8 hours, then discharge to 33. 6V with 0. 5C, ,capacity ≥ 75%.

C Matters needing attention

1. The battery must be charged with the standard special charger in p330pro product package, and it need to be kept away from high temperature.

2. Please charge the used battery in time to avoid over discharge and battery damage caused by long-term storage

3. When the battery is stored for a long time(more than 3 months), the self discharge characteristics of the cell itself will cause discharge damage, so the battery should be charged every 3 months to make the best storage state of single cell voltage at 3. 8V-3. 9V (temperature 20±5℃, humidity 65±20% RH).

4. It is forbidden to use the battery, if it is found deformed or has peculiar smell in the process of use.

5. It is forbidden to put the battery into water or fire under any circumstances.

6. It is forbidden to squeeze, collide, puncture, disassemble and short circuit the battery to avoid unnecessary loss.

D Rules to guarantees of quality

1. The battery guarantee of quality conditions: within 6 months after delivery.

2. Under the condition of quality guarantee, our company is responsible for the quality problems of the battery itself; Problems caused by user misuse or destructive testing are not covered by the warranty.

3. Any of the following circumstances is not included in the Rules to guarantees of quality:

(1)The battery is overcharged or overdischarged;

(2)The battery is stored in high temperature environment;

(3)The battery cause physical damage such as being smashed or the shell being damaged;

(4)) For the battery that the user disassembles and repairs by himself.

Appendix 2 Smart Battery Charger Guide

A Operating instructions

1. Turn on the AC power supply, make sure the input line is plugged in tightly, and the rear switch is set to the gear 0. At this time, the charger does not work. Turn on the rear switch and set it to the gear 1, and the charger will beep.

2. Please connect the battery to the charger, after the battery starts, the charger will automatically identify the type of battery, and then start charging. The LCD will display the current charging state, battery capacity, battery string number, voltage and charging current. The fan will rotate at the same time until the percentage of power is 100%.

3. During the normal charging , short press the middle button that selects mode to enter the secondary interface, and then automatically switch back to the main interface after 5s.

4. During the charging, Short press the switch button under the charging circuit corresponding to the display screen to stop charging, and long press the button again to start charging; When the exception condition is removed, the exception can be removed.

5. Long press the middle button that selects mode to enter the power setting interface to set the charging power, and adjust the power level through the left and right switch buttons.

B Description of abnormal conditions

1. If “check the power supply!" appears on the screen, It means that the input voltage is lower than AC90V. Please check whether the input voltage is too low

2. If “CAN abnormal" appears on the screen, It means that connection between the charger and the battery is interrupted, please replace the battery. If this alarm still occurs, please contact the after-sales technical support of CHCNAV.

C Safety tips

In order to use more safely, please observe the following items, otherwise the charger and battery may be damaged or even lead to fire

1. Please not use the charger unattended. If there is any abnormal function, please stop charging immediately and find out the reason according to the guide.

2. Ensure the charger away from dust, humidity, rain, high temperature and other harsh environment; Avoid direct sunlight, strong vibration, strong collision charger and other physical factors damage.

3. The charger supports input voltage of AC100-240V, If you use a generator to power the battery outdoors,

Please ensure that the generator can provide stable voltage and sufficient power. If the voltage fluctuates, the charger will be damaged.

4. Please place the charger on a heat-resistant, nonflammable and insulating surface. Don't put it in the car seat, carpet and other similar places. Please keep flammable and explosive materials away from the charger operation area.

5. Please do not charge the following types of batteries:

·Battery packs of different models (including different manufacturers).

·Batteries that can't be recharged

·Batteries with special requirements for charging technology.

·Damaged or defective batteries.

·Batteries with built-in combination circuit or protection circuit.

·Batteries installed in other devices or connected to other components.

·Rechargeable batteries is suitable for carrying current of the charger, but it has not been confirmed by the manufacturer

***Only charge the battery specified by charger manufacturer.**

6. The charger is suitable for people aged 14 and above. People with behavioral and mental disorders and inexperienced people need to use it under supervision or guidance.

7. If the power cord is damaged, please return it to the manufacturer, supplier or technician for replacement; If you replace it by yourself, please make sure the power cord has enough power, and make sure that it can be tightly inserted with the input seat, so as not to cause danger.

8. Please strictly follow this guide.

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