

GCS 7.0 & Panda3

User manual

Version : V1.0.6

Revision date : 2018.12.08

Dear customers:

Hello!

Thank you for purchasing and using Feiyu Tech's product. For you can use this product better, please read this introduction carefully before using this product.

Introduction

GCS 7.0 is designed for those plane which were installed the Pandall Autopilot. This introduction aims to introduce the function of the GCS 7.0 to help the users configure the Pandall Autopilot, plan and monitor their flight mission.

Attention

- *If you have any problem during using, you can contact us at any time.*

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- *Our company assumes no liability for any risks related to or resulting from the debug and use of this software (Including the direct, indirect or third-party losses).*
- *The updating and changes of product firmware and program may cause changes in function descriptions in this user manual, please read the instructions carefully before upgrading the firmware and use the corresponding user manual. Feiyu Tech reserves the right to amend this manual and the terms and conditions of use the software at any time.*
- *This Agreement comes into effect automatically when the user uses this software.*

Technical Support

E-MAIL : uavservice@feiyu-tech.com

QQ group : 383653100

TEL : 0773-2320844

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Part I. Software Functions and Instructions

**Goal of this section : Introduce the functions of
GCS7.0 and teach you how to use them.**

GCS 7.0 Interface Instruction

Goal of this section : Introduce the interface and function of the GCS7.0.



GCS 7.0 Constituent Part

1. **Map Area** : Display the plane current location and flight path.
2. **Mini Flight Monitoring** : A status window displays the plane current flight status.
3. **Function Tab** : Switch the software function.
4. **Tool Bar** : Be used to operate the map.
5. **Control Bar** : Send commander to the plane, such as **Take-off** and **Start mission**.

Tool Bar

Introduction : The buttons in **Tool Bar** are mainly used to perform some simple operations on the map. The functions of the buttons are explained below.



Zoom in : Zoom in map



Zoom out : Zoom out map



Marker : Place a marker on the map. Double click can clear the marker



Measure : Measure distance on the map. Double click can clear the trace



Centre : Centre map on plane



Clear : Clear the flight trace

Control Bar

Introduction : The buttons in **Control Bar** are mainly used to control the plane's flight.

Take-off

Start Mission

Landing

Return

Parachute X3

Instruction

Take-off / Cancel : The plane will take off automatically / cancel take-off.

Start Mission : The plane will perform the mission saved in Autopilot.

Landing : The plane will land at the landing point saved in Autopilot.

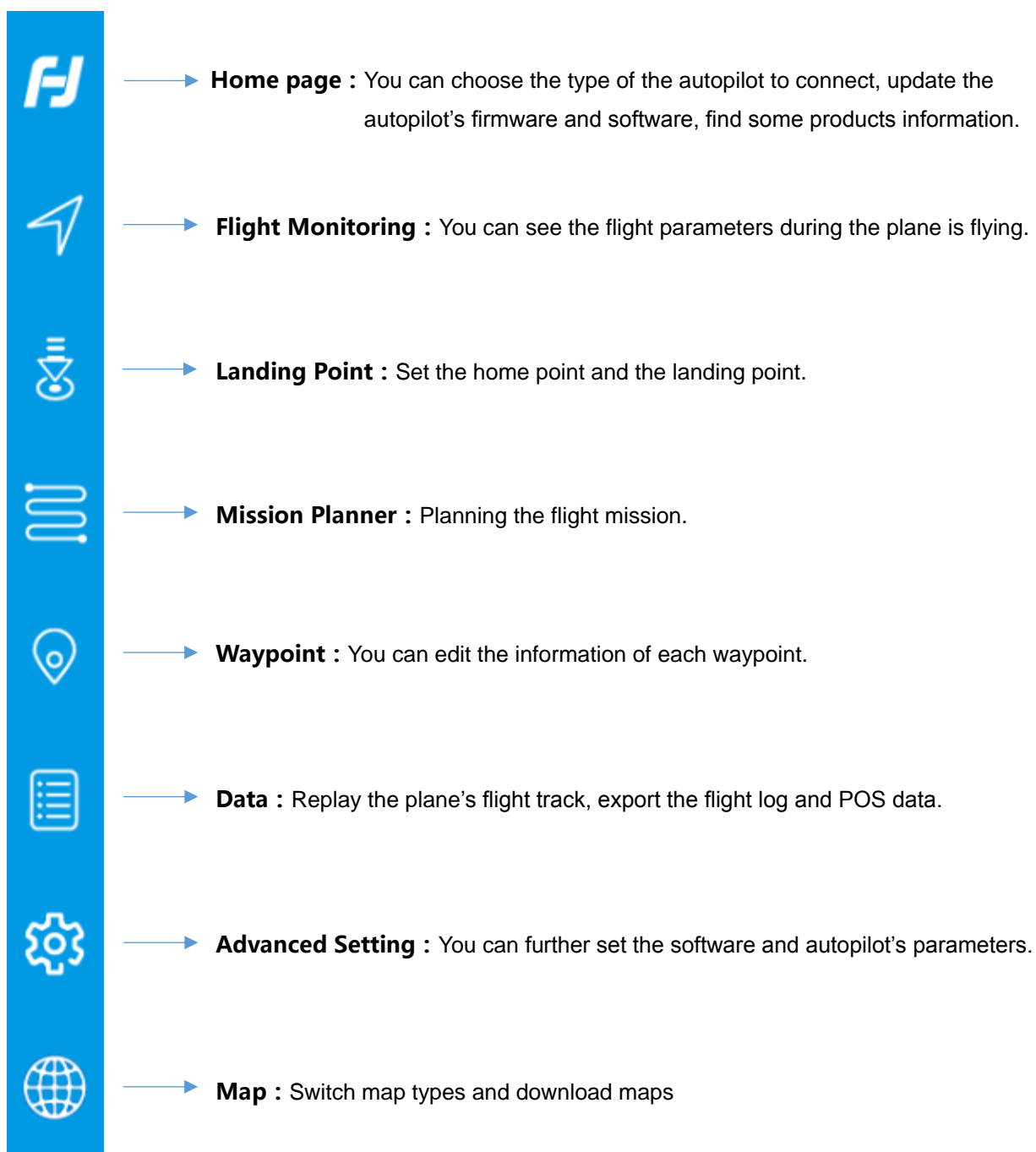
Return Home : The plane will stop any mission, then return to home point and circle around it.

Parachute : Parachute immediately by clicking three times.

Functions Tab

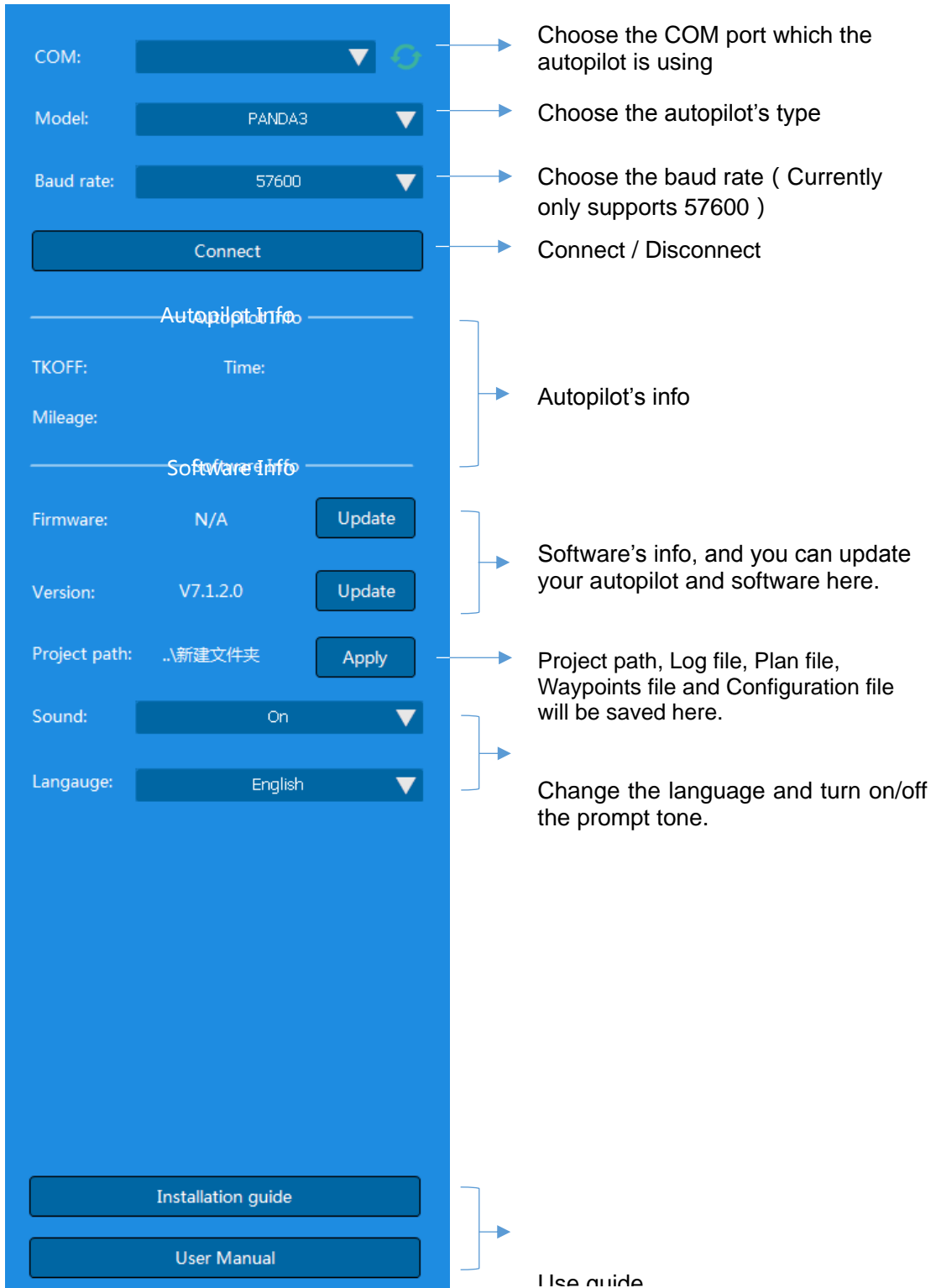
Introduction : You can switch between different features by clicking the icon on the **Functions tab** to help you monitor, plan, and configure plane.

Button Description :



Home Page

Introduction : In this tab, users can choose the autopilot's type to connect, or find some products information.



The screenshot shows a blue-themed interface with the following elements and annotations:

- COM:** A dropdown menu with a refresh icon. Annotation: "Choose the COM port which the autopilot is using".
- Model:** A dropdown menu showing "PANDA3". Annotation: "Choose the autopilot's type".
- Baud rate:** A dropdown menu showing "57600". Annotation: "Choose the baud rate (Currently only supports 57600)".
- Connect:** A large button. Annotation: "Connect / Disconnect".
- Autopilot Info:** A section containing:
 - TKOFF:** and **Time:** fields.
 - Mileage:** field.Annotation: "Autopilot's info".
- Software Info:** A section containing:
 - Firmware:** "N/A" with an **Update** button.
 - Version:** "V7.1.2.0" with an **Update** button.Annotation: "Software's info, and you can update your autopilot and software here."
- Project path:** "..\新建文件夹" with an **Apply** button. Annotation: "Project path, Log file, Plan file, Waypoints file and Configuration file will be saved here."
- Sound:** A dropdown menu showing "On".
- Language:** A dropdown menu showing "English".

Annotation for Sound and Language: "Change the language and turn on/off the prompt tone."

At the bottom, there are two buttons: **Installation guide** and **User Manual**. Annotation: "Use guide".

1) Autopilot Info

TKOFF : The numbers of take-offs.

Mileage : The total flight mileage.

Time : The total flight time.

2) Software Info

If your computer connects with the internet, it will prompt you to download them or not after the GCS detected the new version of firmware and software. Please turn to page 41 to see the step of upgrading the firmware.

3) Project path

The Log file, Plan file, Waypoints file and Configuration file will be saved here. The default path is Project folder under the installation directory.


! **Note** : **Project path** only can be changed when the autopilot doesn't be connected. And the software will choose the last time's path as this time's path.

4) Use Guide

After choosing the autopilot's type, users can open the **Installation guide** and **Preflight guide** to help themselves configure and prepare for their first flight.

Flight Monitoring Tab


Introduction : In **Flight Monitoring Tab**, you can see the plane flight data during flying.



The screenshot shows the Flight Monitoring Tab interface. It is divided into three main sections:

- Instrument:** The top section features a central circular instrument with a red lock icon and the text "Flight Mode". It displays "km/h Spd" (0) and "Alt m" (0) at the top. The instrument has a scale from -20 to 20 on both sides. Below the instrument, it shows "ROLL: 0.0" and "PITCH: 0.0".
- Flight data:** The middle section contains various status indicators: "Data: 0 %", "RC: 0 %", "BAT: 0 %", "GPS: 0". Below these are "Mode: Flight Mode", "GPS SPD: 0 km/h", "Time: 00:00", "AMSL: 0 m", "Distance: 0 km", "Home: 0 m", "Voltage: 0 V", "mAh: 0.0 Ah", "E.Distance: 0 km", and "E.Time: 00:00:00".
- Adjust the Flight Speed Flight Altitude Circle radius:** The bottom section has three adjustable settings: "Speed: 60 km/h", "Altitude: 100 m", and "Radius: 100 m", each with an "Apply" button.

Instrument



This diagram provides a detailed view of the instrument section with the following labels:

- Pressure Altitude:** Points to the "Alt m" display at the top right.
- Airspeed:** Points to the "km/h Spd" display at the top left.
- Motor lock, it will disappear after the autopilot was armed:** Points to the red lock icon in the center of the instrument.
- Heading:** Points to the "Unknown m" display in the center of the instrument.
- Pitch:** Points to the "PITCH : 0.0" display at the bottom right.
- Roll:** Points to the "ROLL : 0.0" display at the bottom left.

Instrument

Airspeed : The real-time flight speed measured by plane airspeed sensor.

Pressure Altitude : The real-time flight altitude of the plane (the vertical distance from the plane current position to the energized position)

Heading : The angle between the axis of the plane body and the north pole of the earth.

Roll : The angle when plane rolls towards left or right.

Pitch : The angle between the axis of the plane body and horizontal plane.

Flight data

Data : The communication quality between the plane and data radio.

RC : The communication quality between the RC controller and RC receiver.

BAT : Battery remaining capacity.

GPS : The amount of satellite that the plane GPS searched.

Mode : The current mode of the autopilot.

Time : The total flight time since the plane takes off.

Distance : The total flight distance since the plane takes off.

Voltage : The current voltage of the batteries.

GPS SPD : The flight speed of the plane relative to the ground.

AMSL : The altitude above sea level.

Home : The distance between the plane current location and home point.

mAh : The consumption of the batteries.

E.Dis : The estimated total flight distance.(Displayed after uploading waypoints)

E.Time : The estimated total flight time.(Displayed after uploading waypoints)

Current : The current measured by the power module

Throttle : The percentage of Output throttle

Speed / Altitude / Radius

Users can changed the plane's flight speed, altitude by input the value and click **Apply**.

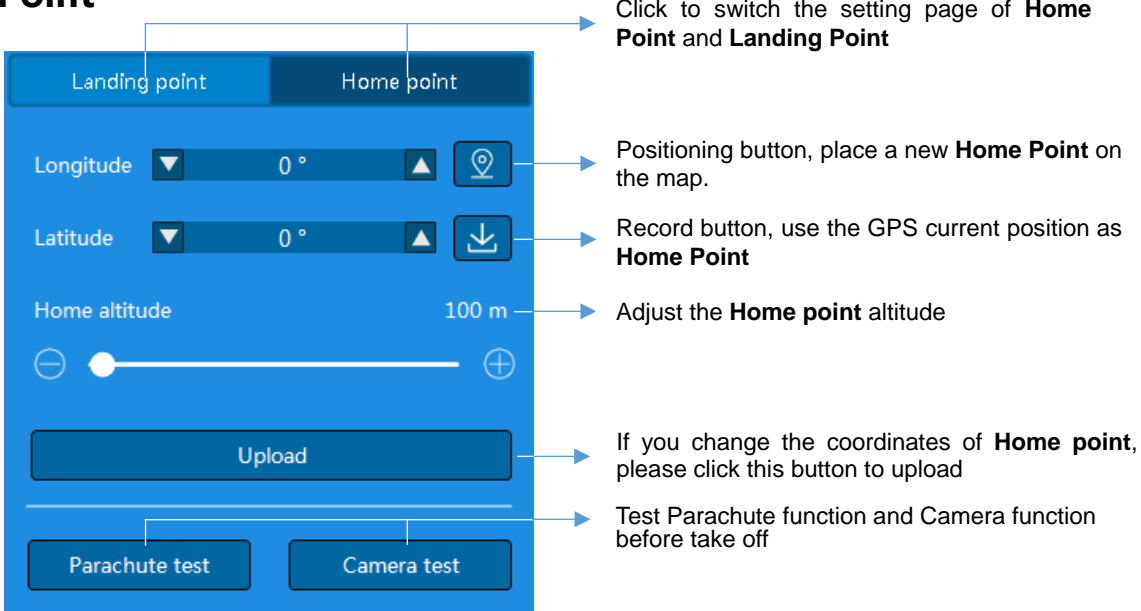
The **Radius** is be used to change the **Landing point's** radius and the **Home point's** radius. Users need to re-upload the Landing point or Home point after changed the value to take effect.

- !** **Note** :
1. The input range of **Speed** is 38km/h ~ 144km/h, default is 60km/h;
 2. The input range of **Altitude** is 100m ~ 2500m, default is 100m, and the maximum value of this parameters that can be input is limited by the **Altitude limit**.
 3. In **Radius**, input **+** value represents clockwise, input **-** value represents anti-clockwise.

Landing Point

Introduction : In **Landing Point** tab, you can set the **Home point** and **Landing point**. The following describes the buttons functions of the **Home point** and **Landing point**.

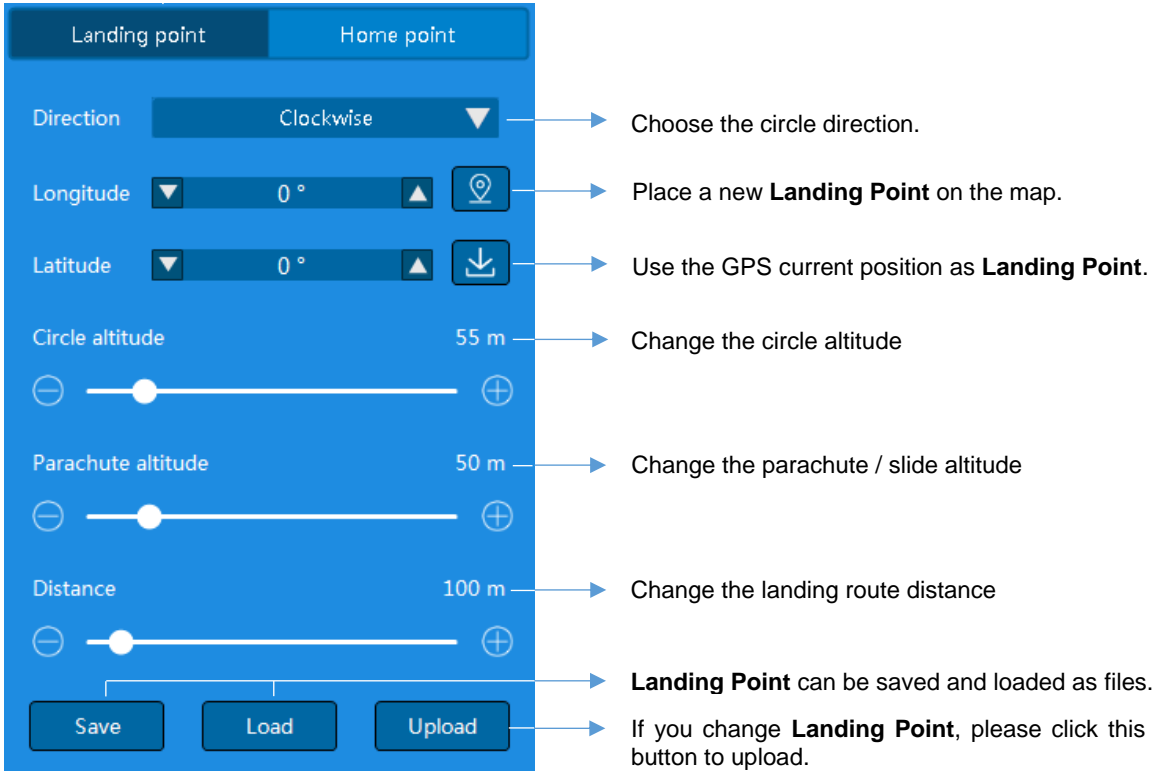
1) Home Point



The screenshot shows the 'Home point' settings page. At the top, there are two tabs: 'Landing point' and 'Home point', with 'Home point' selected. Below the tabs are several controls: Longitude and Latitude, both set to 0° with up/down arrows and a location pin icon; Home altitude, set to 100 m with a slider; an 'Upload' button; and two buttons at the bottom: 'Parachute test' and 'Camera test'. Callouts with arrows point to these elements:

- Click to switch the setting page of **Home Point** and **Landing Point**
- Positioning button, place a new **Home Point** on the map.
- Record button, use the GPS current position as **Home Point**
- Adjust the **Home point** altitude
- If you change the coordinates of **Home point**, please click this button to upload
- Test Parachute function and Camera function before take off

2) Landing Point



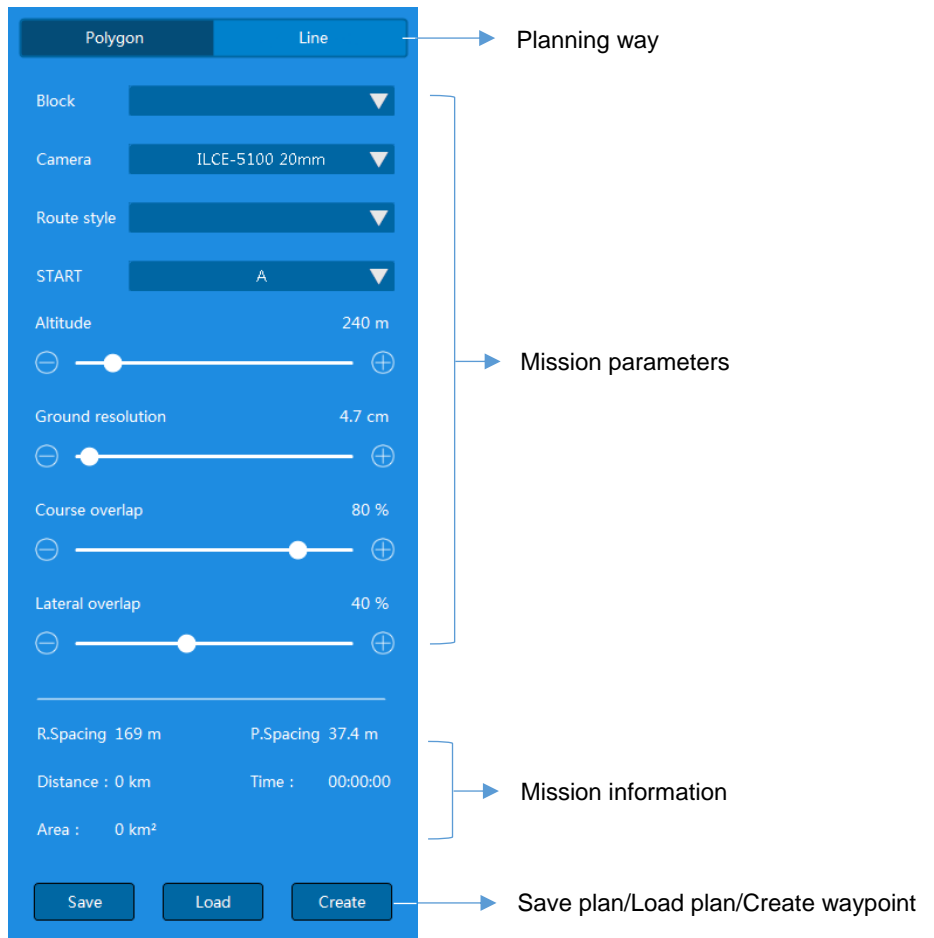
The screenshot shows the 'Landing point' settings page. At the top, there are two tabs: 'Landing point' and 'Home point', with 'Landing point' selected. Below the tabs are several controls: Direction, set to 'Clockwise' with a dropdown arrow; Longitude and Latitude, both set to 0° with up/down arrows and a location pin icon; Circle altitude, set to 55 m with a slider; Parachute altitude, set to 50 m with a slider; Distance, set to 100 m with a slider; and three buttons at the bottom: 'Save', 'Load', and 'Upload'. Callouts with arrows point to these elements:

- Choose the circle direction.
- Place a new **Landing Point** on the map.
- Use the GPS current position as **Landing Point**.
- Change the circle altitude
- Change the parachute / slide altitude
- Change the landing route distance
- Landing Point** can be saved and loaded as files.
- If you change **Landing Point**, please click this button to upload.

! Note : 1. When the GPS is positioned, it will automatically record a home point at the current location.
2. **Home Point** and **Landing point** can also be set by entering latitude and longitude.

Mission Planner

Introduction : In **Mission Planner tab**, you can plan the flight mission for your plane.



Planning way

GCS 7.0 has two mission plans, **Area Mapping** and **Line Mapping**. Users can choose according to their mission requirements.

Mission parameters

Block : Users can build two or more different blocks at the same time. This means the plane can complete multiple-blocks flight under the premise of sufficient battery power.

Camera : Users can choose according to the camera they own, or add a new camera by clicking Add button which is in the Drop-down menu.

Route style : /

Start : Choose the first point that the plane enters the air routes.

Altitude : The altitude when plane flying along the air routes (The air route's altitude)

GSD : The target ground resolution to be achieved, expressed in centimeters per pixel (1 cm/px = 0.4 in/px). This parameter is directly linked to the flight altitude.

Longitudinal overlap : The percentage of overlap between the ground coverage of pictures taken consecutively in the same flight line

Lateral overlap : The percentage of overlap between the ground coverage of pictures from adjacent flight lines.

3) Save plan / Load plan / Create waypoint

Click **Save plan** can save the air routes to your computer, click **load plan** can load the air route file from your computer, click **Create waypoint** can and create the waypoints on the map.

4) Mission information

R.Spacing : The distance between two adjacent routes

Distance : The estimated flight distance required for a plane to finish its mission

Area : The area covered by the route

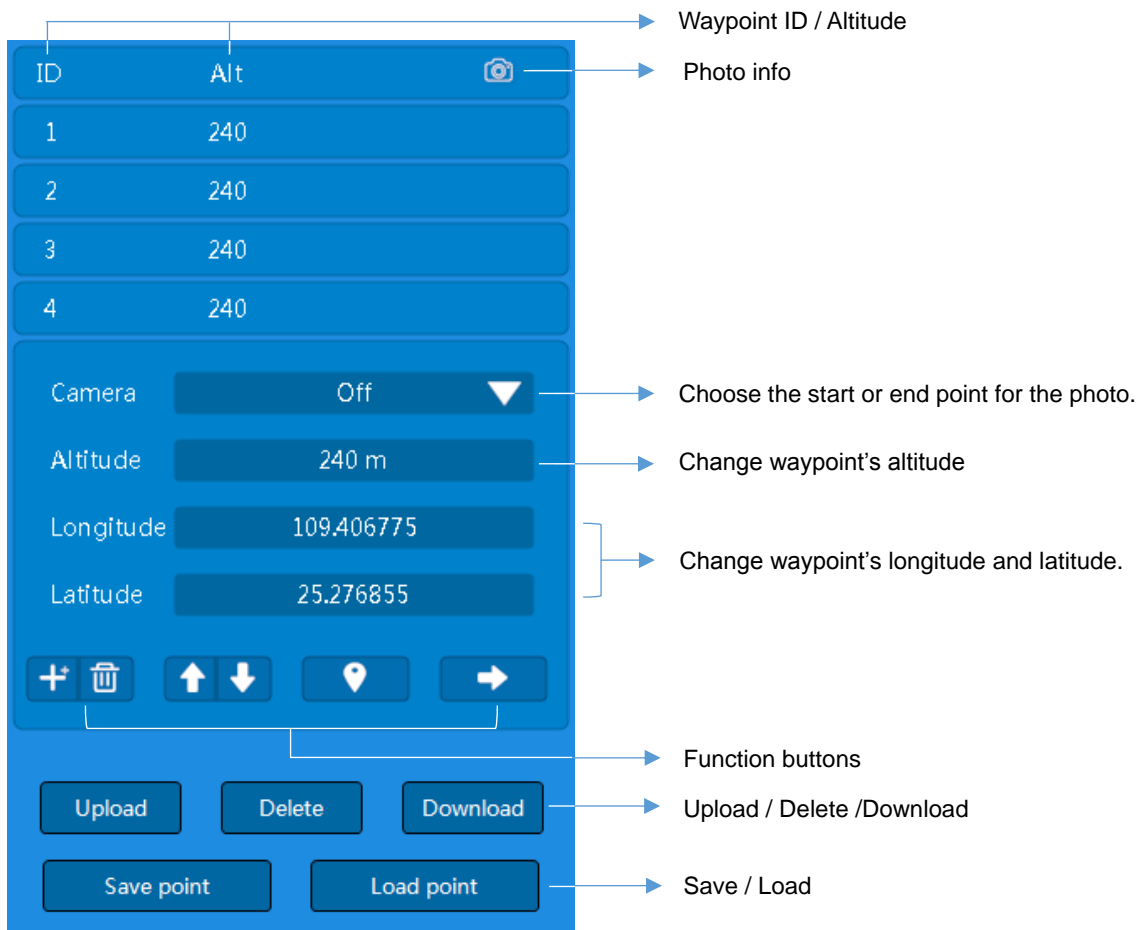
P.Spacing : Distance between two adjacent photos

Time : The estimated flight time required for a plane to finish its mission






! Note : The **Ground Resolution** and the **Route Altitude** can change the altitude of routes, so you only need to adjust one of them.

Waypoint

Introduction: In **Waypoint Tab**, you can see the mission attributes of each waypoint, such as the altitude of the waypoint, whether to take pictures between the waypoints, the coordinates of the waypoints, etc. You can set parameters for one or more waypoint.



1) Function buttons


-  **Insert** : Insert a new waypoint after this waypoint
-  **Delete** : Delete this waypoint
-  **Move up / down** : Move up / down this waypoint
-  **Pick** : Place a new waypoint on the map
-  **Fly to** : Start Mission from this waypoint

2) Upload /Delete / Download

Click **Upload** can upload all waypoints to The Autopilot, click **Download** can download all waypoints from The Autopilot, click **Delete** can delete all waypoints from Autopilot.

3) Save / Load

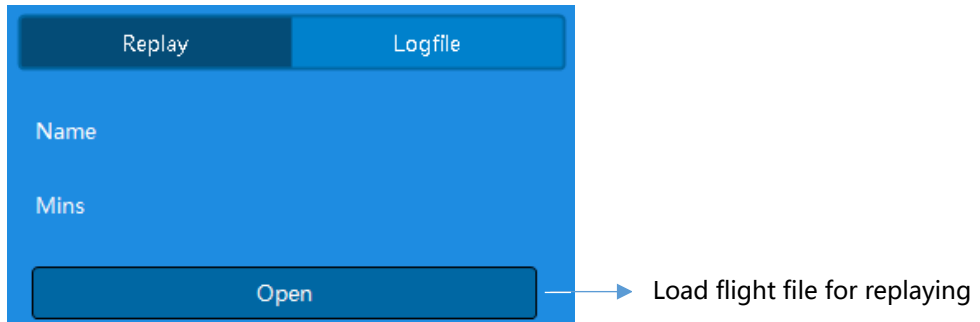
Click **Save / Load**, can save the waypoints on the computer, or load the waypoints file to GCS.

 **Note** : The waypoint file is saved in the data folder under the installation directory.

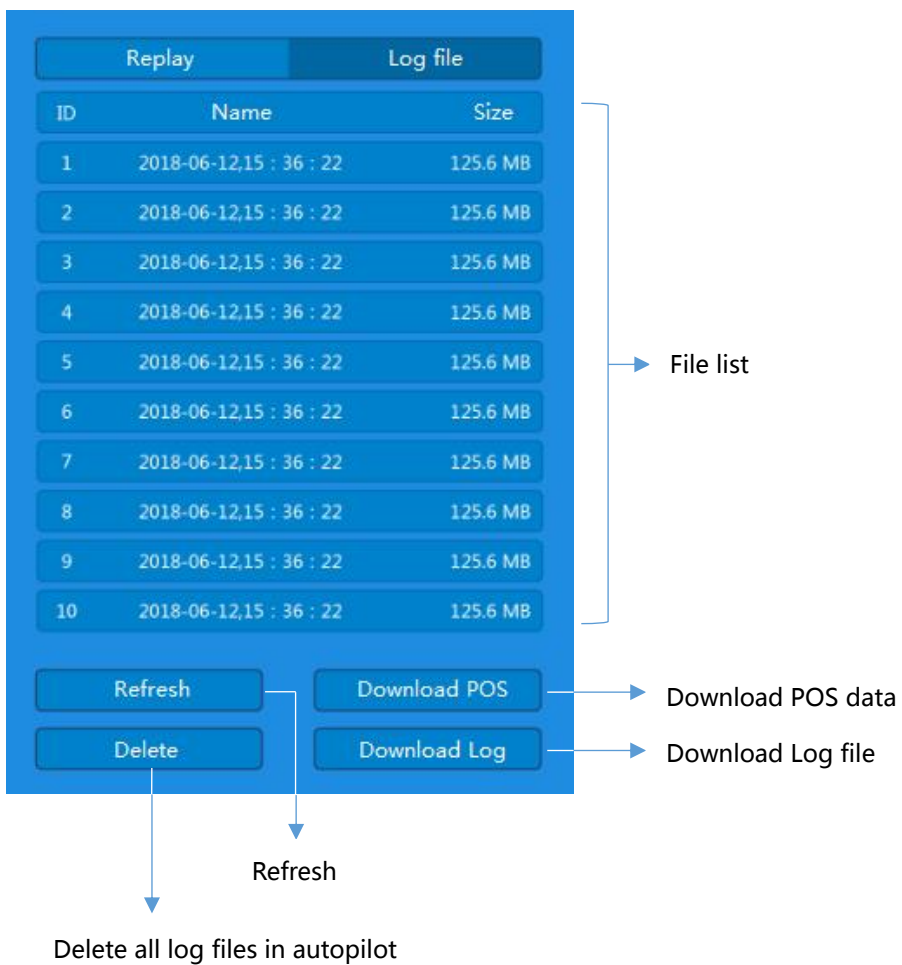
Data

Introduction : Data Tab is mainly composed of two parts, **Replay** and **Log file**. In **Data** tab, you can not only replay flight trace, but also collect log / POS data.

1) Replay



2) Log



! Note : The **log file** and **POS data** are saved in the log folder under the installation directory.

Part II. PandaIII Autopilot

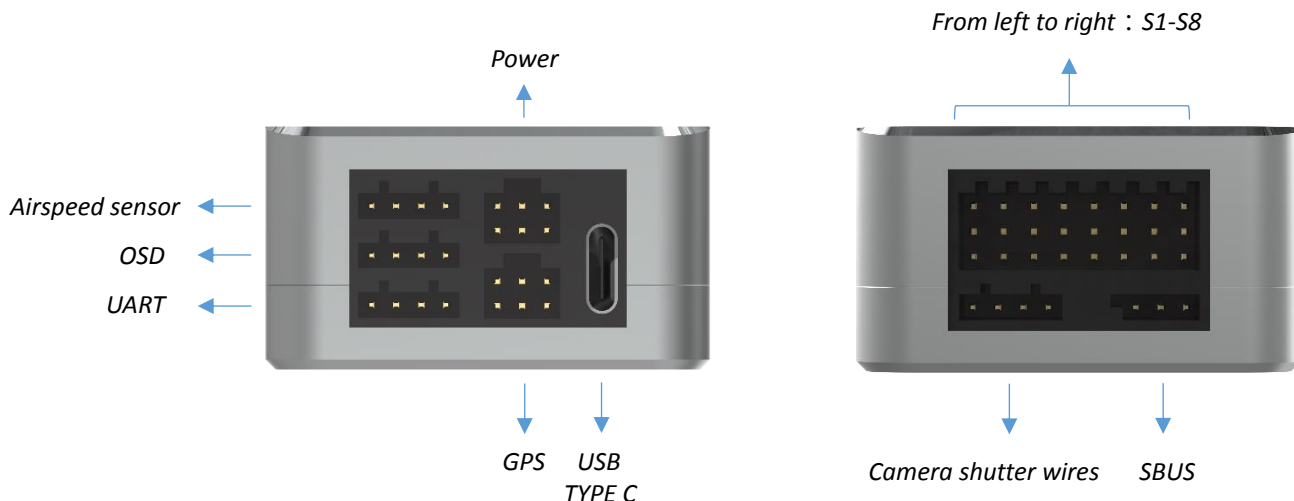
This section will explain the first installation and parameters configuration of the PandaIII Autopilot

Autopilot Brief Introduction

Brief introduction : PANDAIII autopilot is the latest autopilot system developed by Feiyu Tech. It bases on a multi-sensor hardware platform, adopts a more powerful dual-processor platform, and incorporates advanced redundancy algorithms and multi-dimensional EKF algorithms for attitude fusion to form a safe and reliable three-redundancy system. It has a built-in shock absorbing structure and the shell adopts CNC numerical control processing technology, it also has excellent stability and anti-jamming capability, so it can be matched with various fixed-wing plane to achieve accurate flight.



Interface Diagram



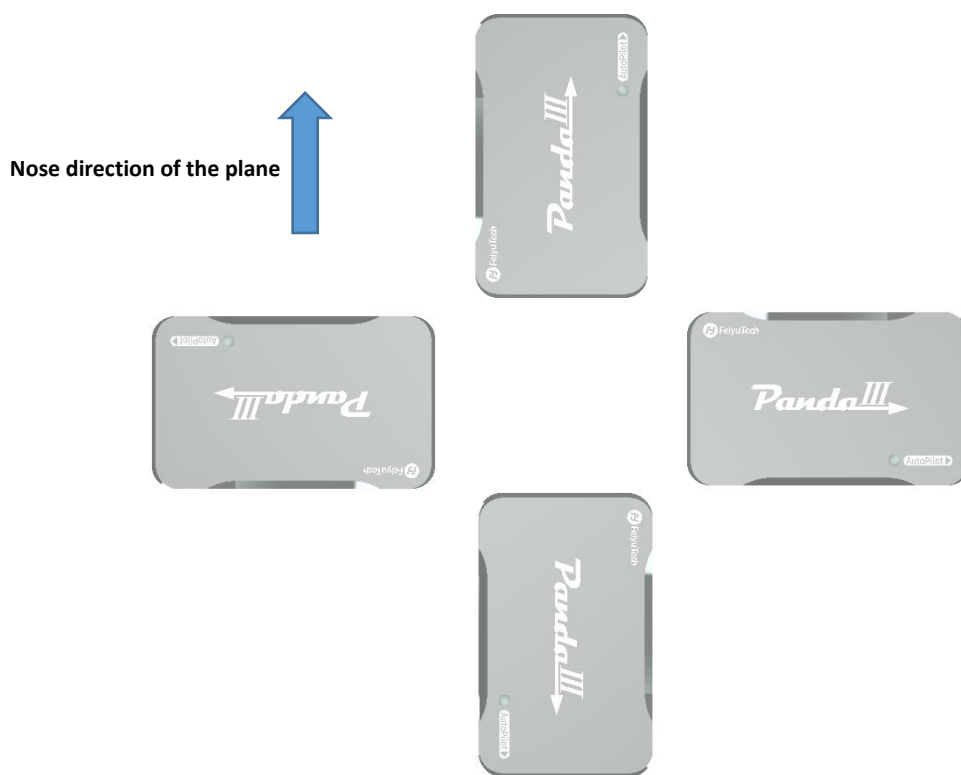
! Note : The Interface definition of the **UART** from the left to right is GND, +5V, TX, RX.

The Installation and Configuration of The Autopilot

Introduction : This section describes the installation and configuration of The Autopilot.

Installation

The Autopilot must be installed horizontally inside the fuselage according to the **Interface diagram**. During the installation process, it should be noticed that the direction of the arrow needs to be at an angle of $0^{\circ}/90^{\circ}/180^{\circ}/270^{\circ}$ to the axis of the fuselage, as shown in the following figure:



S1-S4 is the aileron, elevator, throttle, rudder (AIL, ELE, THR, RUD) interface, S8 is the parachute servo interface. The autopilot supports aircraft with normal layout, Flying wing layout and V-tail layout. The wiring of each layout is as follows:

Normal layout : Use Y line to connect the two aileron servos to S1. Use Y line to connect the two elevator servos to S2. Then connect the ESC to S3, the rudder to S4;

Flying wing layout : Connect left aileron servo to S1, the right aileron servo to S2, the ESC to S3;

V-tail layout : Connect left aileron servo to S1, right aileron servo to S2, the ESC to S3, the left elevator&rudder mix control servo to S4, the right elevator&rudder mix control servo to S5.

- ! Note :** 1. The Autopilot must be installed horizontally.
2. When installing the **GPS** module, please ensure that the antenna is vertical and it should be installed outside the fuselage if conditions permit;
 3. When installing the **Airspeed Sensor**, it should be installed on nose as much as possible. If installed on the wing, the distance between the Airspeed Sensor's tip and the wing's leading edge should be 1/3 of the average chord.
 4. The aircraft's data radio should be as far away as possible from the **Autopilot** and **GPS** modules, and the antenna should be installed vertically up or down.
 5. If the aircraft is a normal layout with only one elevator servo, the elevator servo can be directly connected to the S2.

Connect

OPTION 1 : Connect the Autopilot to the computer using the USB Type C cable. Start the GCS 7.0 software, select the **Model Panda3**, **Baud rate 57600** and **COM port**, and then click **Connect**.

OPTION 2 : Connect the GCS7.0 software's data radio to the computer, start the GCS 7.0 software, select the **Model Panda3**, **Baud rate 57600** and **COM port**, and then click **Connect**.

If built up connection successfully, users can see the data that the autopilot transmits to the software, and the autopilot light will flash blue. If the autopilot connects with the ESC, the ESC will prompt a **No motor signal detected** tone, indicating that the motor is locked, which can prevent the user from accidentally touching the throttle or button and causing the propeller to rotate and finally causes injury to user.



- ! Note :** 1. Please confirm whether the antenna is tightly connected before power-on when using the data radio for communication, so as not to burn the radio.
2. You can purchase a FY-608 **data radio** or a data radio that meets the following specifications:
 - Baud rate : 57600
 - Data bit : 8
 - Parity bit : none
 - Stop bit : 1

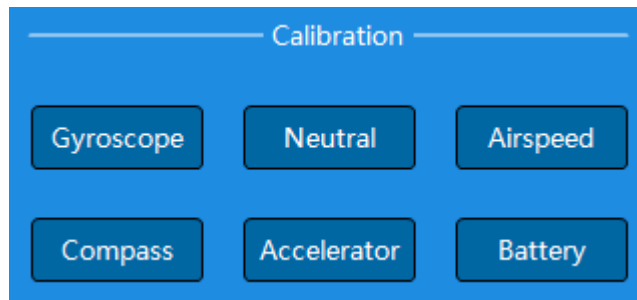
Basic Settings

In **Advanced Settings** → **Autopilot**, find **Model** and **Orientation**, and set according to the model of the user's plane, the software will prompt to restart the autopilot. After restart the autopilot, please set the installation direction of the autopilot. After setting, click the **Apply** to upload it to the autopilot.



Sensor Calibration

The **Compass**, **Gyroscope**, **Accelerometer**, **Neutral point**, **Airspeed sensor** and **Battery** are calibrated in sequence in the **Autopilot** → **Sensor Calibration**. When entering the corresponding calibration, the software will have corresponding operation prompts, and the user only needs to operate according to the operation prompts. After finishing all the calibrations, click the **Apply** to upload it to the autopilot.

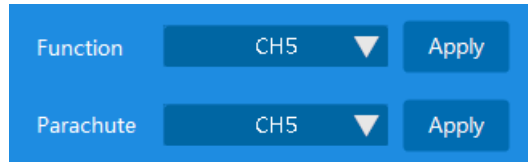


- ! Note :**
1. **Neutral point** records the pitch angle of the plane when it is flying horizontally. The calibration should base on the plane model.
 2. After the calibration is completed, check the corresponding parameters to confirm that the parameters are correct.
 3. The users need to do the calibration only when the autopilot is installed for the first time, or when the sensor measurement has a large error.

Remote Control Calibration

The **Remote Control Calibration** is aim to make the autopilot records the maximum and minimum values of the remote control channel. Please follow the software prompts to complete the calibration.

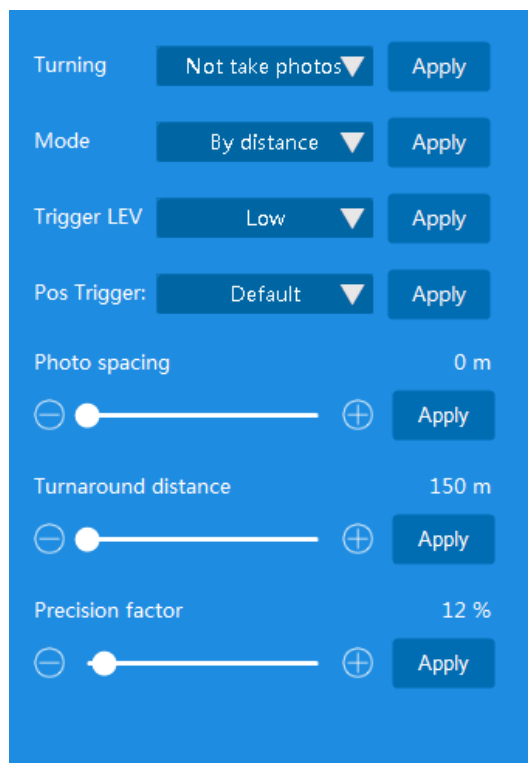
Then, set the parachute channel and function channel. It is aim to set the channel for RC to control the parachute and the mode switching. Finally click the **Apply** to upload it to the autopilot.



The **Function channel** supports Stabilize, Manual and Return. **We suggest that the users have better do a checking after setting. If users want use the Remote Controller to switch to Take-off mode, please push the Throttle stick to the bottom right to unlock the autopilot before switch to the Take-off mode(Push the Throttle stich to the bottom left can lock the autopilot)**

Camera

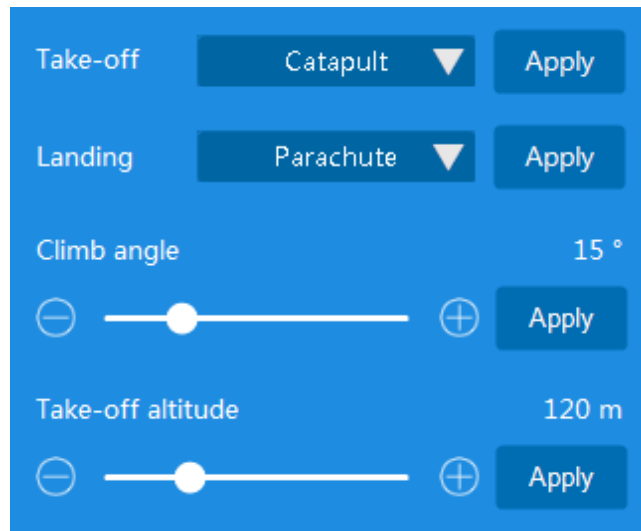
Select **Timing Photographing** or **Distance Photographing**. The rest of the settings can be set according to the user's task requirements.



! Note : 1. The **Photo interval** is the same as the **Longitudinal overlap** in the Mission Planner panel. You only need to set one of the two items when planning the route.
2. If the autopilot cannot trigger the photo, you should modify the photo trigger level.

Take-off and Landing Settings

In the **Autopilot Settings**, select **Take-off Mode** and **Landing Mode**, then click **Upload** button at the bottom to save. If users want to use **Parachute Mode**, please insert the parachute servo into the S8.



Take-off modes

The Autopilot supports two take off modes, **Catapult-Assisted** and **Hand-throw**. The mechanism of **Catapult-Assisted** is, when the autopilot receives the **Take-off** command, it will gradually increase the throttle to the maximum. The mechanism of **Hand-throw** is, when the autopilot receives the take-off command, the user shakes the aircraft up and down, at this time autopilot will gradually increase the throttle to the maximum. Therefore, users should pay attention to avoid the damage caused by the rotation of the propeller when using the two take-off modes.

Note : The **Take-off angle** and the **Take-off altitude** need to be set according to the take-off environment.

Examination

After finishing all the settings, please click **Read** to check whether the parameters were set correctly.

Check the Installation direction and Model

Click **Read** to check the setting is correct or not. Raise the plane and make pitch and roll movement, and check through the instrument panel, whether the plane's movement is correct or not.

Check the sensors

Measure the battery's voltage and compare with the value measured by the GCS to check whether the voltage is correct or not. Raise the plane and blow lightly to the airspeed sensor, check that whether the altitude and airspeed has changes or not. Make the plane and a compass point to a same direction, then check the value on the compass and compare with the instrument panel, whether the value is same or not.

Check the PID and Failsafe


Users can adjust the PID value for their first flight according to the **PID Control** in the following text. After finishing adjusting, please click Read to check whether the values were set correctly or not. Users can turn on/off the Failsafe function according themselves need. After finishing adjusting, please click Read to check whether the settings are correct or not.

Check the Camera

Use the camera cable to connect the camera with autopilot, and remember to plug in the Hot Shoe, then choose **Hot shoe** in **Setting** → **Mission** → **POS** (If your camera does not has a Hot shoe interface, please choose **Default**). Then switch to **Landing point** page, click **Camera test** button to check whether the software can control the camera to take photos normally or not.

Check the Stabilize function and RC

Switch the mode to Stabilize and check whether the servos move correctly or not. If the servos movement are reversed, users can change the setting in **Servo**. Then use the Remote Controller to control the servo to check whether the servos movement are correct or not. If the servos movement are reversed, users can change the setting in **RC**.

 **Note** : User should make sure that the **Stabilize** function is correct first, then check the Remote Control function.

Check the Arm/Disarm function

After all the calibrations were finished, please switch to the **RC** page and follow the following step to test the motor lock function.

Mode 1 Remote Controller

Push the **Left stick** to the bottom right, and observe the RC CH3 is min, RC CH4 is max = **Arm**

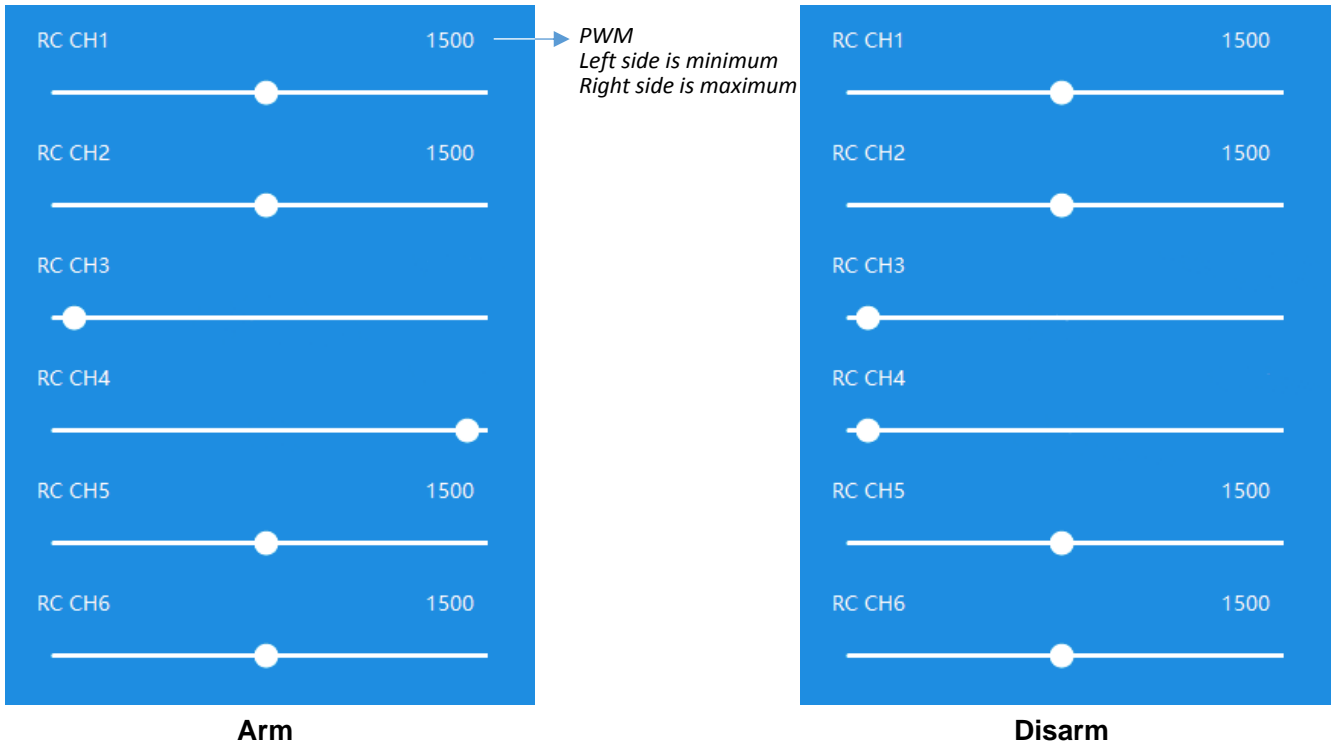
Push the **Left stick** to the bottom left, and observe the RC CH3 is min, RC CH4 is min = **Disarm**

Mode 2 Remote Controller

Push the **Throttle** to the bottom, the **Left stick** to the bottom right, and observe the RC CH3 is min, RC CH4 is max = **Arm**

Push the **Throttle** to the bottom, the **Left stick** to the bottom left, and observe the RC CH3 is min, RC CH4 is min = **Disarm**

If you cannot arm the autopilot, please set reverse for Channel 3 / Channel 4 / Channel 3 and 4 on your Remote Controller until meet the above conditions.



! **Note :** 1.The calibration cannot be done after you arm the autopilot.
 2.If you cannot use the remote controller to control the Throttle, please reboot the autopilot and try again.

Part III. Mission Plan

This section explains how to perform a mission with GCS 7.0 software using a plane equipped with a PandaIII autopilot.

Step1 : Connect

Turn on your plane's power and the data radio, open the GCS 7.0, choose **Model Panda3**, **Baud rate (57600)** and **COM port**, and then **Connect** to build up the communication.



If built up connection successfully, you can see the prompt from the software and the data that the autopilot transmits to the software, and the autopilot light will flash blue. This time, the ESC will prompt a no motor signal detected tone, indicating that the motor is locked, which can prevent the user from accidentally touching the throttle or button and causing the propeller to rotate and finally causes injury to user.

Note : COM port can be found in the device manager

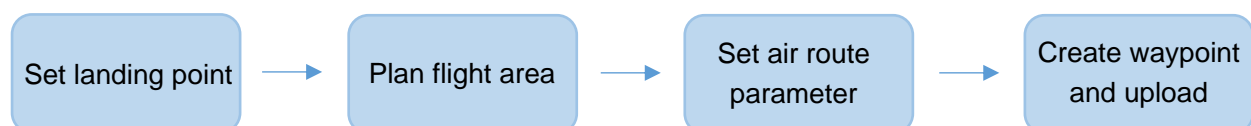
Step2 : Select Map

Choose the map type in **Map** icon (This function needs the user's computer has a connection with the internet). You also can download the offline map at home and load it when you are outdoors.

Note : You can also click **Load KML** button to download map and plan mission if you have KML files.

Step3 : Create a flight mission

The following tells you how to create a flight mission.



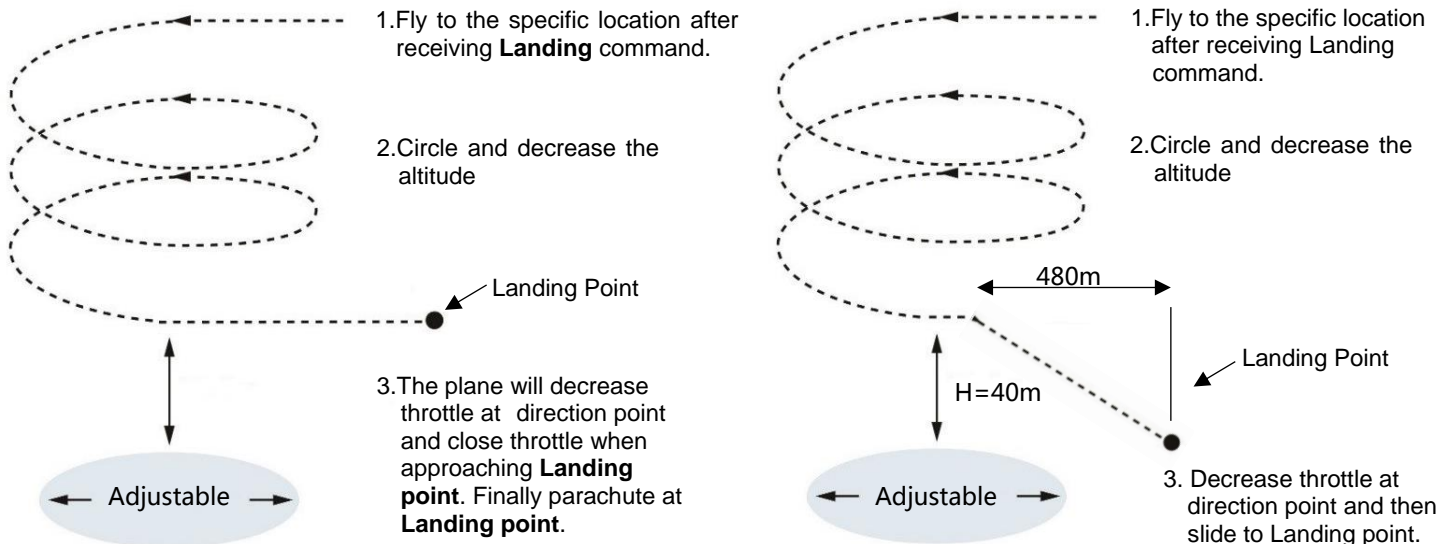
Attention : Aerial surveys are required to comply with local laws and regulations and it is forbidden to fly in no-fly zones and sensitive areas.

1) Set Landing point and Home point

Autopilot's landing mechanism and principle


The Autopilot supports two landing modes: **Parachute** and **Slide**. The following explains the landing principle and setting method of the two landing modes.


The landing route consists of **Circle Point** and **Landing Point**. When you send command **Landing**, then the plane will fly to **Circle point** to circle and decrease the altitude. When the altitude drops to landing altitude, the plane will fly to **Landing Point** to land. The whole progress is as shown below:



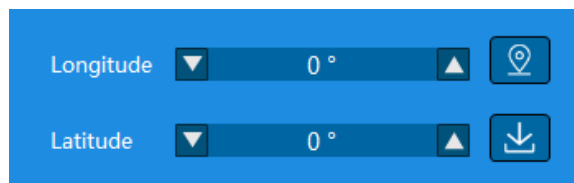
How to set the landing route

Users have three ways to set the landing point:

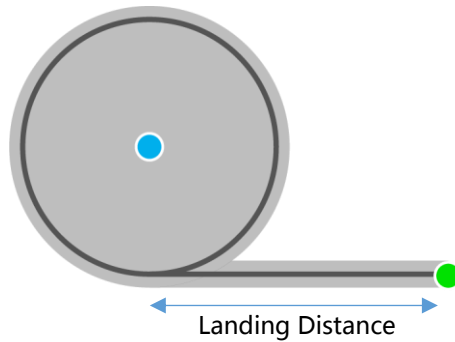
1. Use the GPS current coordinates as the landing point's coordinates : Take the plane to the expected landing position, and then click  to collect the coordinates of the landing point. Then, the landing point's location will display on the map area, and the circle point will be automatically created. The user can drag the circle point around the landing point to adjust the direction in which the plane landed.

2. Choose landing point by clicking on the map area : Click  to select the location of the landing point on the map. After the completion, the location of the landing point will be displayed on the map area. At the same time, the direction point will be automatically created. The user can drag the circle point around the landing point to adjust the direction in which the plane landed.

3. Input latitude and longitude coordinates :



After the input is completed, the location of the landing point will be displayed on the map area, and the direction point will be automatically created. The user can drag the circle point around the landing point to adjust the direction in which the plane landed. As shown in the figure below, the **blue** point is the direction point and the **green** point is the landing point.



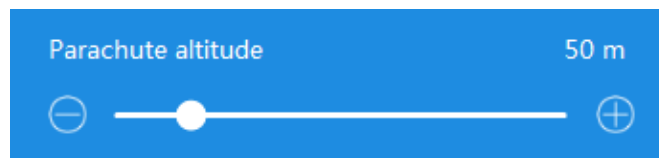
The distance of the landing route can be adjusted at **Landing distance** :



After completing the setting of the landing point coordinates, set the circle direction at **Circle direction** :



After completing the landing direction setting, set the landing altitude at **Altitude** :

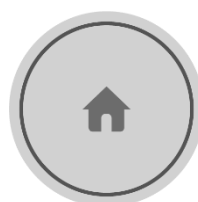


After completing all settings, click **Upload** to upload the landing route to the autopilot.

! Note : 1. **Circle radius** can be changed in the **Flight Monitoring Tab** → **Circle Radius**.
2. The **Slide mode's Altitude** and **Distance** are fixed, 40m and 480m respectively.


The function of Home Point


When the users send command **Return**, the plane will fly to the **Home point** and circle around it. When the plane is powered and GPS is located, the software creates a **Home point** at the current location of the plane and displays it on the map.



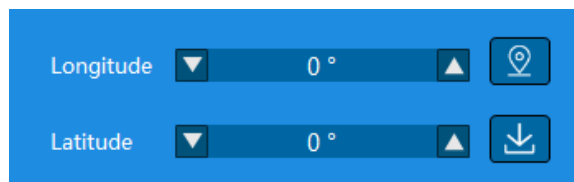
Set the Home point

Users have three ways to set the Home Point :

1. Use the GPS current coordinates as the Home Point's coordinates : Take the plane to the expected Home position, and then click  to collect the coordinates of the Home Point. Then, the Home Point's location will display on the map area.

2. Choose Home Point by clicking on the map area : Click  to select the location of the Home Point on the map. After the completion, the location of the Home Point will be displayed on the map area.

3. Input latitude and longitude coordinates :



After the input is completed, the location of the Home Point will be displayed on the map area.

Then, set the home altitude in the **Altitude**.

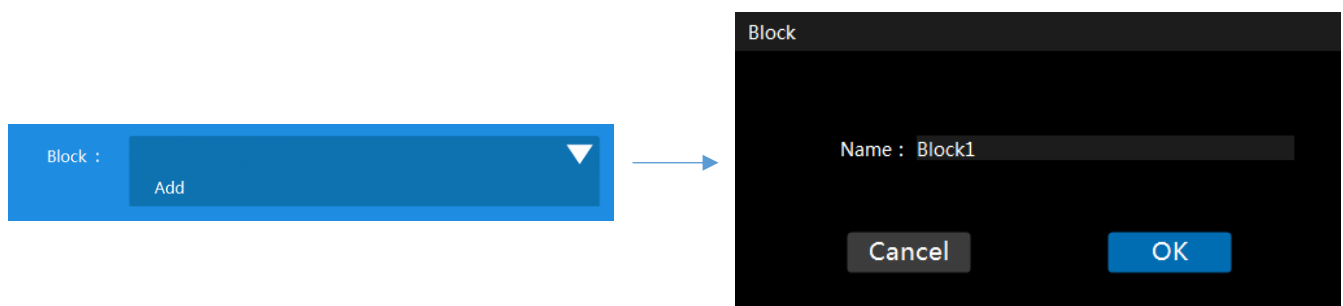


Click **Upload** to upload the landing route to the autopilot after finishing all settings.

! Note : The radius of the plane circling around the home point can be modified in **Flight monitor tab** → **Circle radius**.

2) Select route planning and create blocks

Firstly, click **Mission Plan icon** in Function Tab. Secondly, select a way to create your mission and build up a new block.



3) Draw a route

GCS 7.0 offers two ways for you to draw the route : **Polygon Mapping** and **Line Mapping**. The following will explain the two ways and you can choose according to your aerial survey requirements.

Polygon Mapping

Rectangle : Click on map to create a rectangular area. Drag the edge of the planning area can stretch the rectangular area. Drag the central circular shadow area to move the planning area. Dragging the dots on the corners can rotate the planning area.



Polygon : Double click the dots on the corners will generate 4 green marks, which we call them planning points. Click on the edge of the block can add a new planning points. In this case, you can drag these planning points to adjust the size and shape of the planning area.



Line Mapping

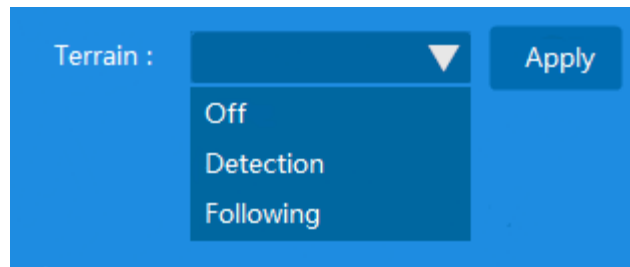
Click on the map area to create waypoints.



Note : The block can be deleted by clicking **X** button in the down drop menu of **Block**.

Advance function — Use terrain data

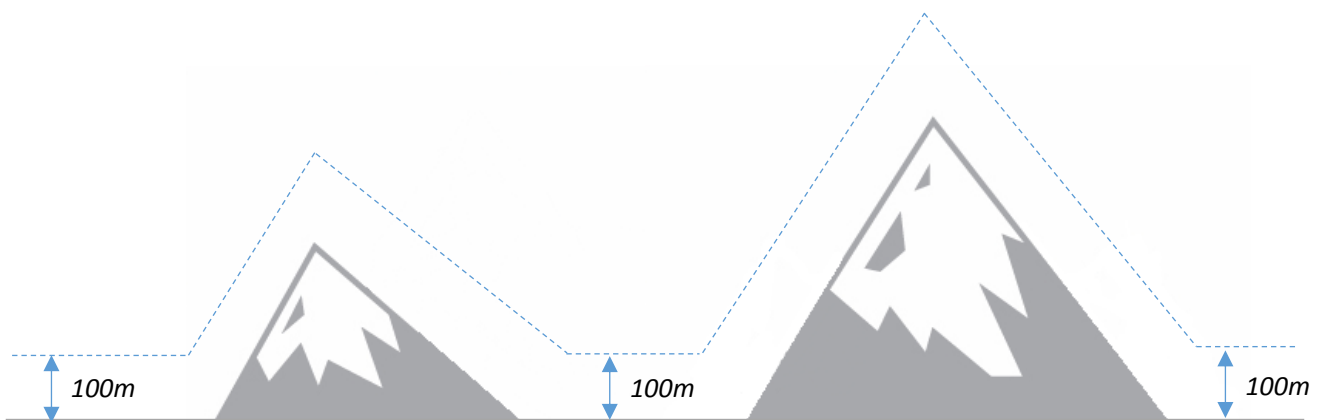
If your computer is connected to the Internet, the GCS 7.0 will download the terrain data automatically. You can choose to enable this function in **Advance** → **Mission** → **Terrain**. (You need to delete all the waypoints before turn on this function)



Terrain Detection: After create waypoints, the GCS software will automatically check the height difference between the route and the ground based on the elevation data. If the height difference between the route and the ground is less than 50m, the route will be displayed in red as shown in the figure below.



Terrain Following (Custom Mapping Only) : After create waypoints, the GCS software will automatically adjust the route's altitude based on the elevation data to make the route and the ground always maintain a fixed relative altitude. As shown in the figure below, supposing the user sets the waypoint's altitude to 100m.



After completing the route planning, click **Create**. At this time, the page will jump to the **Mission Information** tab, set **Photo start point** and **Photo end point**. Finally click **Upload** to upload the waypoints to Panda3.



Note : It is recommended to click the **Delete** button after completing the waypoint upload, and then click the **Download** button to confirm whether the waypoints were uploaded successfully or not.

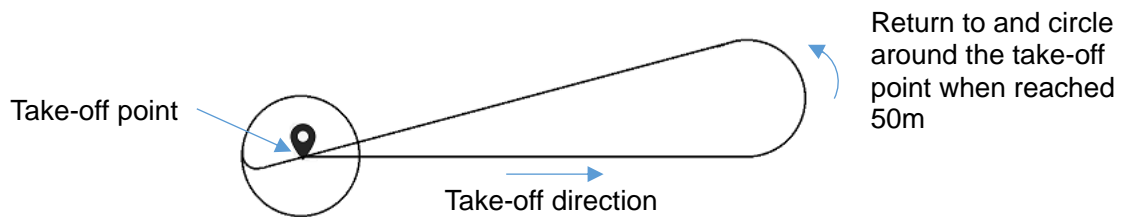
Caution : The users need to know the following situations about the uploading of **Waypoints** and **Landing points** :

1. The landing point and the waypoints must be uploaded to the autopilot together. You cannot upload the landing point firstly, then upload the waypoint (and vice versa).
2. The users can also plan mission and create waypoints firstly, and the software will prompt the user that the **Landing point** has not been set at this time, the users can continue to upload the waypoint. If need to upload the landing point later, the users only can do this operation when the plane is in non-Mission mode (If the landing point is uploaded before the plane completes the mission, the waypoints will be cleared, so we suggest that the users upload the landing point after the plane finished mission)
3. If the users only uploads the landing point, the plane will go to the landing point after command and go to the landing point after the user sends the **Mission** command.

Step 4: Take-off, Start Mission and Landing

Take-off

Click **Take-off**, the plane will automatically increase the throttle to the maximum. After the speed is stable, you can throw or eject it, then it will fly straight and climb up. When it reaches 50m, it will turn to the takeoff point and continue to climb to the take-off altitude. After reaching the takeoff point, the plane will circle around it and wait for the next command. The whole progress is shown as the following picture:



Top view of automatic take-off process

- ! Note :**
1. If users use Throwing way to take-off the plane, please shakes the aircraft up and down, at this time autopilot will gradually increase the throttle to the maximum
 2. If users want use the Remote Controller to control the throttle to Take-off the plane, please push the **Left stick** to the bottom right to arm the autopilot. If the user's remote controller is **Mode 1**, please make sure that the throttle is at the bottom before use the **Left stick** to arm the autopilot.

Start Mission

Click **Start Mission**, the plane will fly to the first waypoint and start auto-navigation flight. If you have already set **Photo Start Point** and **Photo End Point**, then the plane will take photos automatically.

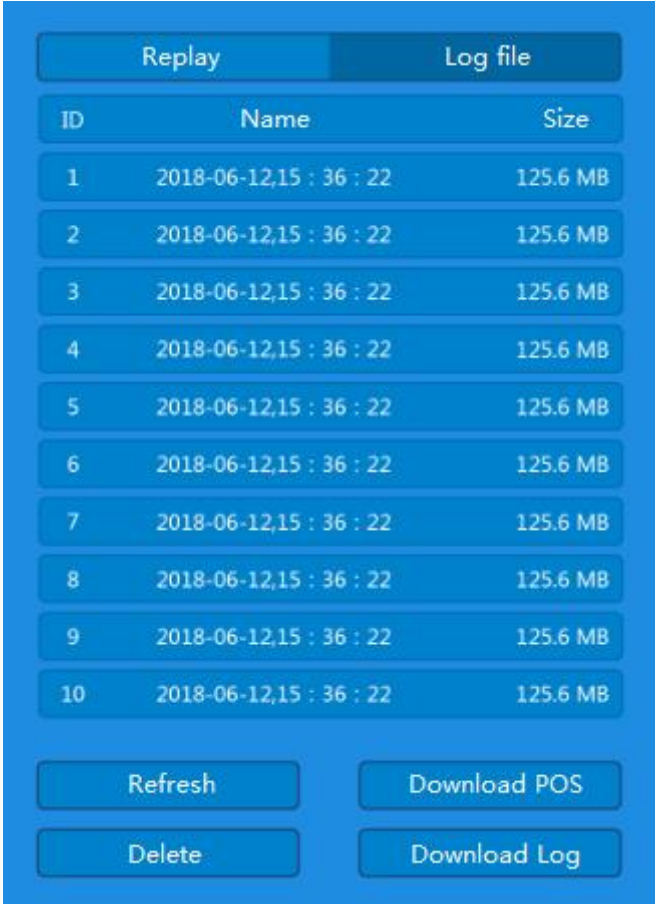
Landing

After the mission is completed, the plane will execute the landing command automatically. When the plane landed, the autopilot will automatically lock the motor to prevent accidental injury to user during the recycling process.

- ! Note :** If user do not need the plane go land automatically after the mission is completed, please do not plan and upload the landing point to the autopilot.

Step 5: Read POS Data

Use the USB Type-C cable to connect the autopilot with GCS 7.0. After establishing the communication, click **Data** tab and switch to the **Log Files**:



ID	Name	Size
1	2018-06-12,15 : 36 : 22	125.6 MB
2	2018-06-12,15 : 36 : 22	125.6 MB
3	2018-06-12,15 : 36 : 22	125.6 MB
4	2018-06-12,15 : 36 : 22	125.6 MB
5	2018-06-12,15 : 36 : 22	125.6 MB
6	2018-06-12,15 : 36 : 22	125.6 MB
7	2018-06-12,15 : 36 : 22	125.6 MB
8	2018-06-12,15 : 36 : 22	125.6 MB
9	2018-06-12,15 : 36 : 22	125.6 MB
10	2018-06-12,15 : 36 : 22	125.6 MB

Click **Refresh** button. After the software prompted to read the log file list is completed, select the POS file you need and click **Download POS** button.

The POS data of The Autopilot consists of the following contents shown in the following table.

POS data

Field 1 : Photo ID

Field 2 : Shooting time (hour)

Field 3 : Shooting time (minute)

Field 4 : Shooting time (second)

Field 5 : Latitude (°)

Field 6 : Longitude (°)

Field 7 : GPS altitude

Field 8 : Press altitude

Field 9 : Angle of pitch (°)

Field10 : Angle of roll (°)

Field11 : Head course angle (°)

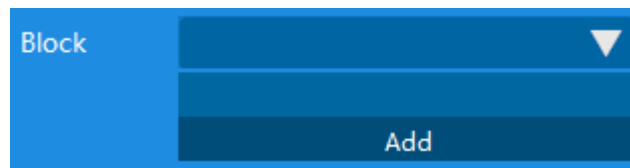
Part IV. Advanced Functions

Multi-block Planning

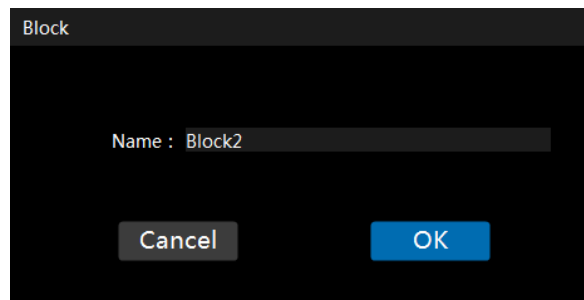
Introduction : Multi-block planning connects the flight lines of two different mission blocks so that the plane can fly to two mission blocks in one flight.

How to use Multi-block planning

After the first mission block is created according to the operation described above, choose the planning way to be used in the next mission block. Then, click the **Add** button in **Block** list:



Then the software will pop up a dialog box, enter the name of the mission block and click OK to create the second mission block.



Click the **X** button in **Block** list if you need to remove a mission block.

How to connect different mission blocks

Assume that the user has created three mission blocks A, B, and C. If you want to fly in the ABC order, you should first choose the mission block A to create the waypoints, and then choose B, C to create waypoints.

- ! Note :**
1. Only one mission planning way can be used in one mission block.
 2. The mission parameters in each mission block are independent, A and B block can be set different parameters.
 3. Multi-block flight is different from multiple flights. Using multi-block planning, you can complete missions for multiple parcels in one flight under the premise of sufficient power.
 4. The **Photo interval** of the multi-blocks need to be set in **Advanced** → **Mission** → **Photo interval**, it means that each block cannot use independence photo interval. If the mission only has one block, please set the photo interval by **Course overlap** according to the **Mission info**. But if the users change the value of the **Photo interval** in **Advanced** after generated a block, then please take it as the criterion.


Continue Mission

Introduction : When the plane interrupts the mission for some reason, the user can use this function to let the plane return to the last unfinished mission.

How to return to the last unfinished mission

Download the last unfinished waypoints from the autopilot to the software.



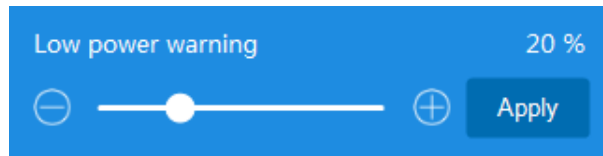
If the last mission is interrupted between the no.5 and no.6 waypoint, click the no.5 waypoint to show the waypoint information, and click the button  to send the command to start mission from this point.

Failsafe Function

Introduction : The Autopilot has several built-in safety mechanisms to minimize plane damage in an accident.

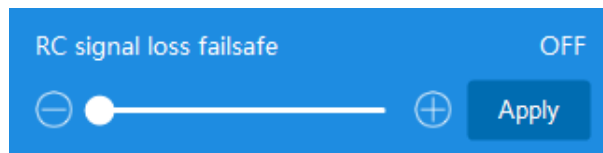
Low voltage warning

The user can set the warning voltage in **Advanced settings** → **Failsafe**. After the GCS7.0 software detects that the voltage reaches the set value, it will automatically prompt the user that the voltage is lower than the set value.



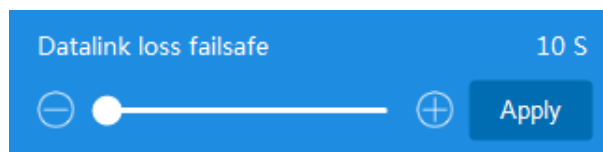
RC signal loss failsafe

When this function is enabled, **Auto return** function will be triggered automatically when the autopilot detects the loss of RC signal. The user can set how long it takes to trigger the return home function. This function is enabled by default. The function can be turned off if the value is set to **Off**. This function only works in **Manual mode**.



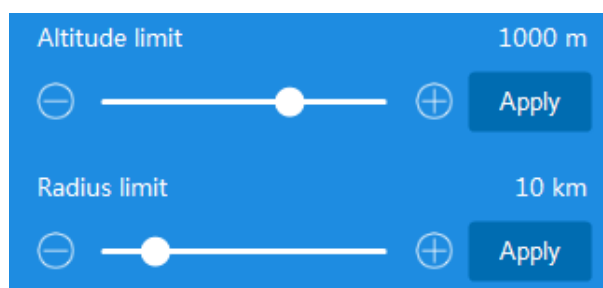
Datalink loss failsafe

When this function is enabled, **Auto return** function will be triggered automatically when the autopilot detects the loss of datalink. The user can set how long it takes to trigger the return home function. This function is enabled by default. The function can be turned off if the value is set to **Off**.



Geofence

In **Geofence**, users can setup the flight area's size. Once this function was turned on, the waypoints only can be planned in the flight area. **If the waypoints are beyond the flight area, then the Mission command will not be send to the autopilot successfully.**



PID control

Flight accuracy control

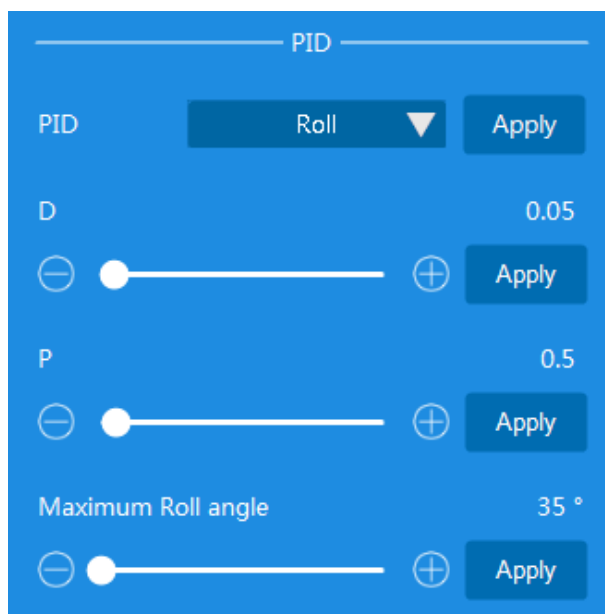
In **Advanced setting** → **Mission** → **Accuracy factor**, the user can adjust the accuracy (deviation) of the plane flight route. If there is a deviation in the flight lines of the plane and the accuracy is not high, you could increase the value until the plane can accurately fly the route.



Note : If the value is excessively lowered, the sensitivity of the relevant sensor may be too high, resulting in the plane's action amplitude being too intense, such as excessive movement during cornering.

PID control

In **Advanced setting** → **PID**, the user can adjust the attitude of the plane. Choose the Roll or Pitch and click **Set** to confirm, then click **Read** to read the default value.



Proportion adjustment

The effect of the proportion is to adjust the system error correction's efforts. Increasing the proportionality factor will increase the efforts that the aircraft corrects errors and makes the flight attitude lock more precise. If the aircraft is controlled by a remote control, the effect is that the aircraft can quickly stabilize at the target attitude position. However, if increase this coefficient excessively, it will cause the control oscillation, which is reflected in the flight attitude will oscillate back and forth around the target posture, for example, the plane flies a "S" way along the line.

Damping adjustment

The effect of damping is to control the pre-judgment, correct the disturbance, and improve the response speed of the control. Increase the damping coefficient, the response speed of control is more obvious, the remote control operation is more sensitive, and the servos responds more timely. But if the coefficient is too large, the control response will overshoot, the specific phenomenon is that the control response is fast but the control result will be exceeded the target.

The following table is the recommended value for the 3 layouts

	Normal	Flying-Wing	V-Tail
Pitch D	0.08	0.15	0.08
Pitch P	0.5	0.55	0.5
Roll D	0.05	0.15	0.05
Roll P	0.5	0.7	0.5

Offline Map

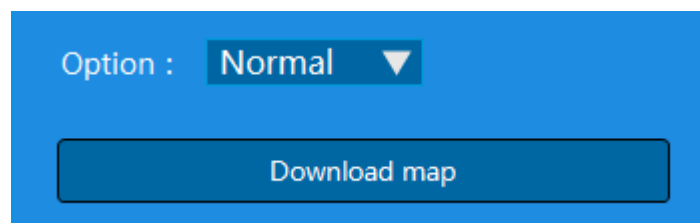
Introduction : If users are inconvenient to use online map in outdoors, the offline map can be downloaded indoors in advance.

How to download offline map

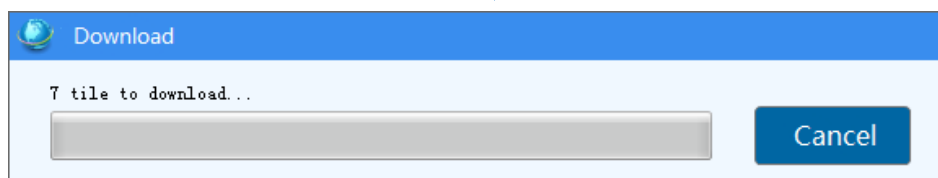
Switch to the **Map** icon, use the left mouse button to select the area's upper left corner and bottom right corner, then choose the resolution and click **Download** button. The downloaded area will be automatically loaded the next time start the software.



1. Select the area



2. Choose the resolution and download the map



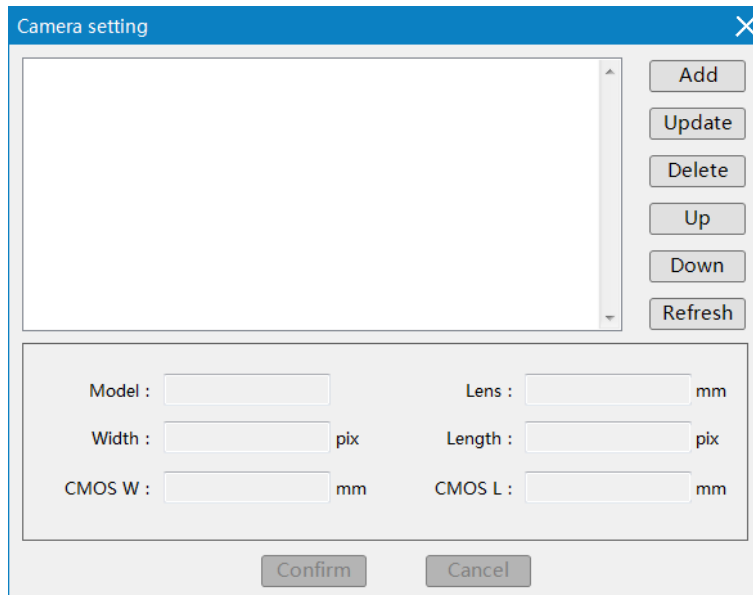
3. Waiting for the download completed

Camera Model

Introduction : The GCS software prepare several camera for users to choose. And users also can add the camera models in GCS software.

How to add camera models

Click **Mission Plan** icon, found the Add button in the **Camera's** drop down menu.



The screenshot shows a 'Camera setting' dialog box. It features a list area on the left, currently empty, and a set of control buttons on the right: 'Add', 'Update', 'Delete', 'Up', 'Down', and 'Refresh'. Below the list area, there are six input fields arranged in two columns. The left column contains 'Model', 'Width', and 'CMOS W'. The right column contains 'Lens', 'Length', and 'CMOS L'. Each field has a unit indicator: 'mm' for Lens, Width, and CMOS L; 'pix' for Width and Length. At the bottom of the dialog are 'Confirm' and 'Cancel' buttons.

Click **Add**, input the camera's parameters and click **Confirm**, then the new camera model can be found in the **Camera's** drop down menu.

Parameter description

Type : The camera type.

Lens : The focal length of the camera's lens.

Length : The length of the image resolution.

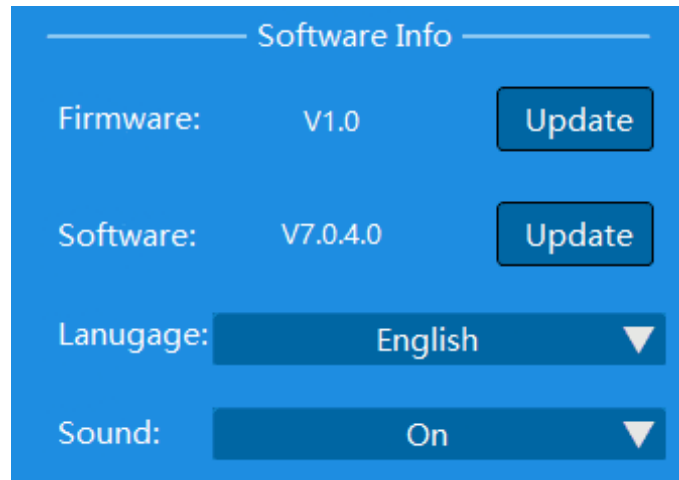
Width : The width of the image resolution.

CMOS L : The length of the CMOS size.

CMOS W : The width of the CMOS size.

Autopilot firmware update

First, find the **Firmware** option in Home page.



How to update the autopilot's firmware

Online update (Please make sure the computer is connected to the internet) :

Use the USB Type-C to connect the Autopilot with computer and establish communication with GCS 7.0, then the GCS will prompt you to download them or not after it detected the new version of firmware and software. Follow the instructions to complete the update.

Offline update 1 :

Use the USB Type-C to connect the Autopilot with computer and establish communication with GCS 7.0. Find the autopilot firmware which suffix is .fy and open it. After the progress bar shows 100% and prompts for a reboot to complete the firmware update.

Offline update 2 (Force update) :

Use the USB Type-C to connect the Autopilot with computer. Find the autopilot firmware which suffix is .fy and open it. Follow the prompt, reinsert the Autopilot to enter the update progress. After the progress bar shows 100% and prompts for a reboot to complete the firmware update.

How to update the software

Open the GCS and **make sure the computer is connected to the internet**, it will detect and download the installation pack automatically.

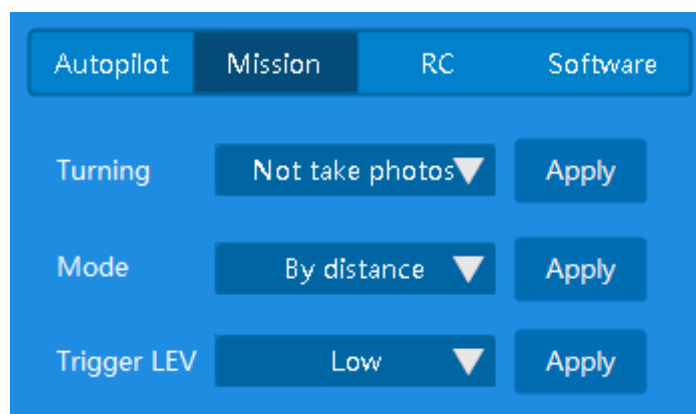
! Note : 1. Please uninstall the Old GCS before installing the New GCS.
2. If you interrupt the download, you can click **Update** to download the installation pack again.
3. The update package will be saved on desktop after downloading.

Not take photos while turning

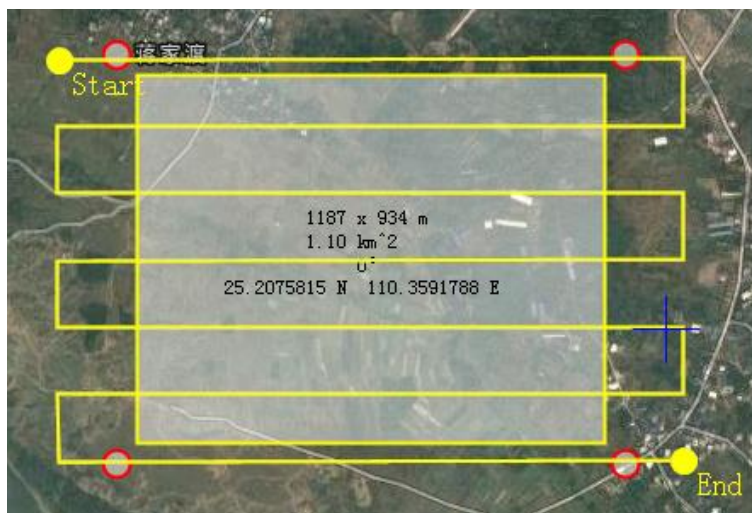
Instruction : When this function was turned on, the autopilot will control the camera stop taking photos while turning.

How to turn on this function

In **Advanced** → **Mission** → **Turning**, choose the **Not take photos** to turn on this function. This time, the minimum value of **Turnaround distance** will be limited to 200m.



Then, enter the **Mission planner** to create blocks, waypoints and upload waypoint. The GCS will set the photo points automatically.



The shadow area is the photo area

Note : Please do not change any waypoint's position except the first and last waypoint.