CUAV

LecentGroundControl

V1.0.0-beta4

User Manual

CUAV Tech Inc.,Ltd.

2025/07

CONTENTS

Note before use

LGC Ground Station Technology Explorer Edition is based on the secondary development of QGroundControl, and is intended for testing purposes only, and is not to be used as an accessory to the product or for commercial purposes. This note mainly describes the differentiated function descriptions, for generalized tutorials, please visit https://docs.qgroundcontrol.com/master/en/qgc-user-guide/.

The LGC Ground Station is primarily intended for end users or novices, with some necessary safety restrictions to improve flight safety. It does not necessarily conform to the usage habits of experienced users. Optimizations and new features are based on the ArduPilot firmware and may not necessarily be adapted to the PX4 firmware.

Feel free to share your experience and any problems you encountered via the following email. pm@cuav.net

Major differences based on QGC version 4.4.3

1. New features
    a. Support network RTK (CORS/NTRIP).
    b. Added on-board ADSB function for Ardupilot models
    c. Support GCS flight mode lock configuration to restrict and hide flight modes with high risk factor.
    d. Support one-key course altitude correction
    e. Support MAVlink forwarding, support UAV forwarding to UAV, realize inter-aircraft communication.
    f. Support RTMP video streaming, can stream the video to the live platform
    g. Support viewing real-time flight data of multiple aircrafts at the same time.
    h. Supports scanning remote ID messages around and displaying them.
2. Exploration test function
    a. Support cluster formation flight, applicable to fixed-wing/vertical take-off and landing fixed-wing/multi-rotor models, optimize one-stop control logic for multiple aircraft.
3. Optimization Functions
    a. Enrich and improve Chinese translation
    b. Optimize the display of flight data, and show the Chinese instrument panel.

c. Optimize the mandatory checklist to guide newbies to pre-flight check.
d. Encrypt all parameter interfaces to prevent newbies or misuse from adjusting flight parameters.
e. Optimize MAVLINK pod gimbal control, support displaying two images at the same time.
f. Modify QGC video encoder from decodebin3 to decodebin to support some H264 RTSP video streams.
g. Optimize the display of battery information, add current, and set to display percentage/voltage.
h. Optimized flight view for vertical takeoff and landing fixed wing.
   - Add wind vane indicator and wind speed
   - Add real-time altitude and speed shortcut commands, hover radius command
   - Add airspeed zero and start point update.
i. Optimize the configuration portal and functions of Remote ID to meet China's policy requirements.
j. Optimize the reminder window after modifying parameters, and support one-key restart.

4. Fixes
   a. Repair the bug of route planning in QGC Chinese mode.
   b. Fix the problem that some serial ports cannot be found in the connection configuration.

Major differences based on LGC 1.0.0-beta version

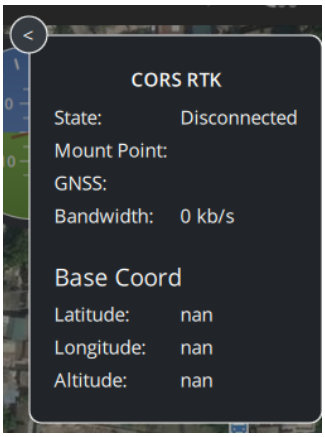
1. Upgrade and optimize remote ID scanner
    a. Support Bluetooth scanning, support Bluetooth and WIFI to be turned on on demand.
    b. Optimize remote ID information display interface
    c. Support map display location
    d. Support drone proximity alert
2. Add simulator function
    a. Support software-in-the-loop simulation for Ardupilot firmware.
    b. Support vehicle types such as plane, multi-copter, rover, and sub.
    c. Support single creation or batch creation of simulations
3. Add about LGC page
    a. Add version upgrade reminders
    b. Migrate the disclaimer function to the "About LGC" page.
    c. Add shortcut entrance to related platforms
    d. Add feedback and evaluation portal
4. Fixes
    a. Fixed the problem that when disconnecting a drone in the case of multiple drones, the setting menu of the remaining drone is lost.

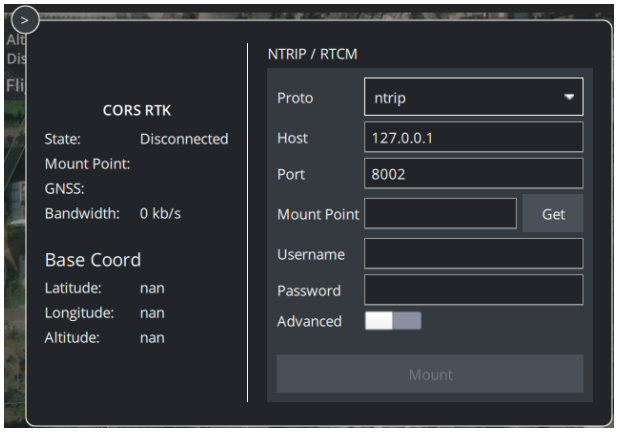
1. Network RTK (NTRIP)

⚠To use CORS/NTRIP service LGC needs to be connected to the internet service; you can use WIFI hotspot or cell phone USB to share the mobile network, make sure that the drone has been positioned and connected to the ground station before configuring (the ground station needs to send a GGA message to get the nearby CORS service).

LGC supports network RTK (CORS/NTRIP). Click the icon 

in the upper right corner of the main interface to check the RTK status, and click the icon  to display the NTRIP setting interface.



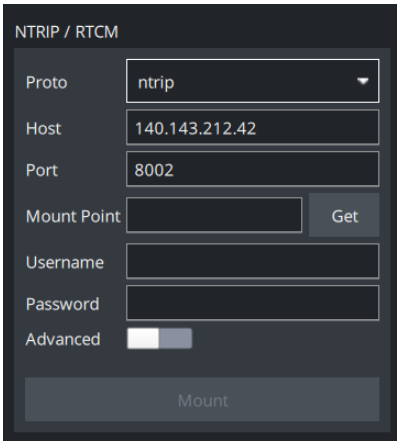


CORS/NTRIP Connection:

In the NTRIP setting interface, fill in the corresponding protocol, fill in the **address**, **port**, and check Connect to server to connect.

Port number: Geographic Coordinate System

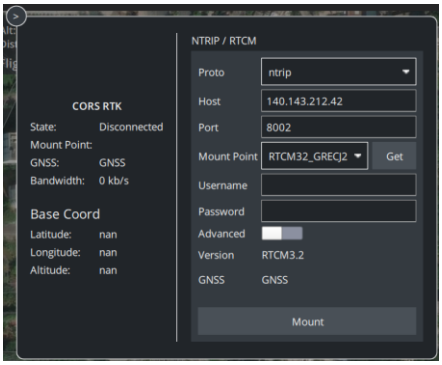
8001: CGC2000

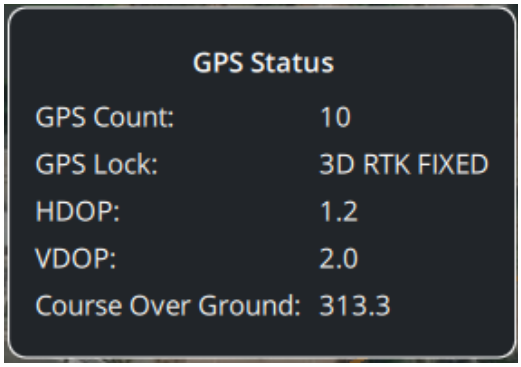


8002: WGS84 (coordinate system used by flight control)

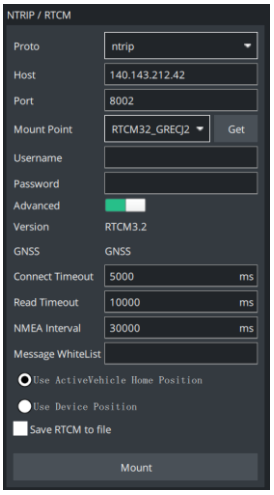
8003: ITRF2008

After completing the form, clicking **Get** will display a list of mount points for selection, as shown in the figure below. After selecting a mount point, enter the **username** and **password**, click **Mount**, and check that the GPS status has changed to “3D RTK FIX” to confirm that the setup is successful.





It is also possible to personalize the settings (e.g. connection timeout, read timeout, NMEA timeout, etc.); you can select "use the home point of the drone" or "the GPS location of the currently running ground station device" as the transmission location for NMEA (Note: the location is only acquired when the connection is clicked and does not change in real time). (Note: the position is only obtained when the connection is clicked, and will not follow the change in real time).



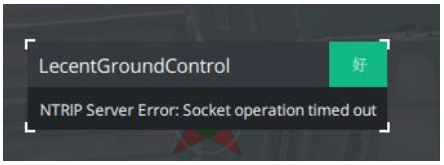
Ephemeris storage:

If you need to use PPK for mapping, you need to save RTCM data. You can check "Save RTMP to file" (the location is in the NTRIP folder of the application load/save path, the application load/save path can be seen in Application Settings->General ->Miscellaneous), and the name of the saved file is rtk_Year_Month_Day_Hour_Minute_Second. rtcm (UTC). rtcm (UTC= BST-8h) format.

Error description:

Check whether the account password is correct and valid, and whether you have permission to mount the corresponding mount point.

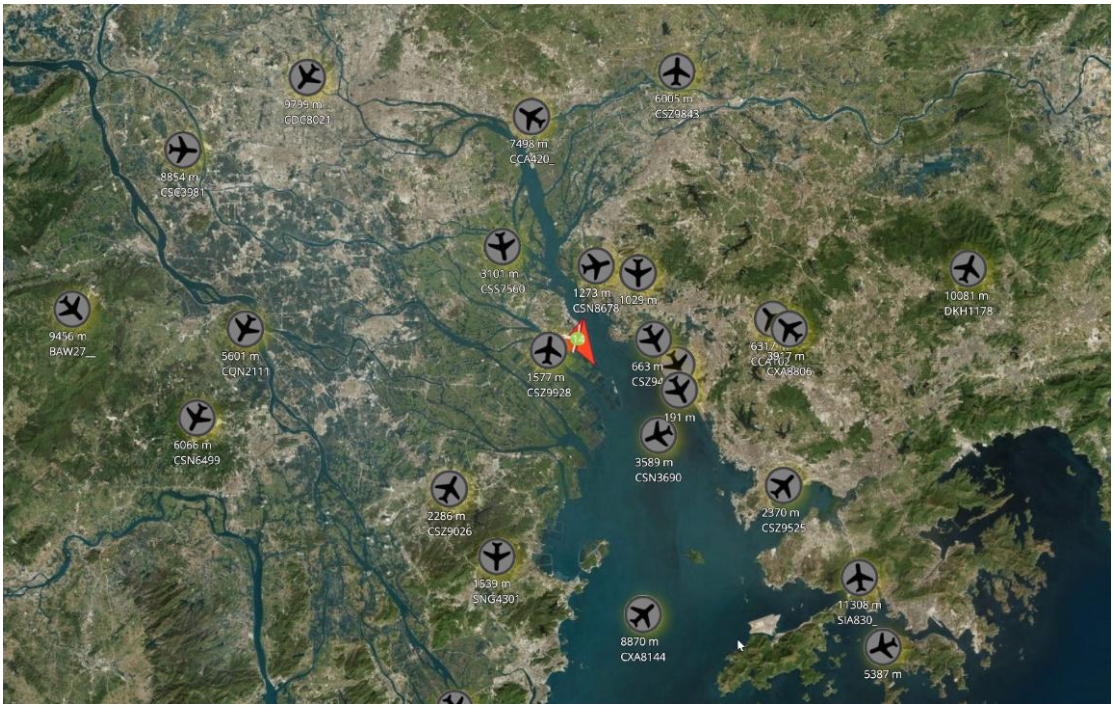
Check if the server address and port are correct and valid.



2. Optimize onboard ADSB support

⚠ADS-B (also known as Broadcast Automatic Correlation Surveillance) is an air traffic surveillance technology. It is a safety surveillance device that allows ground station operators to sense nearby manned aircraft and can keep the craft away from them automatically.

LGC has optimized support for the ArduPilot airborne ADSB device with a flight data refresh rate of 50Hz and a device refresh of 1 minute/time.



ArduPilot ADSB key parameters:

ADSB_TYPE=1 //ADSB device type

ADSB_LIST_MAX=50 //Maximum number of airplanes to be monitored by ADSB

ADSB_LIST_RADIUS=10000 //Radius of ADSB monitoring, only aircraft

within this radius will be displayed

SerialX_BAUD=115 //Communication baud rate between ADSB and flight control, X is serial number.

SerialX_Protocol=2 //Communication protocol between ADSB and flight control, X is serial number.

SrX_ADSB=5 //Ground station from which flight control serial port to get ADSB data and frequency, X is the serial port serial number.

3. LGC Flight Mode Lock

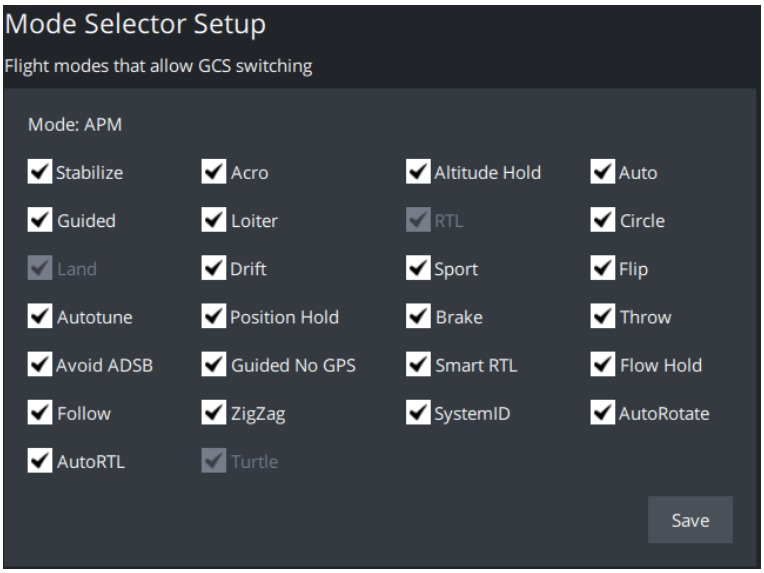
Simplified Flight Mode (aka GCS Mode Lock). It is a feature of the Ardupilot firmware that allows the user to specify (check) the flight mode to be used by the actual ground station. Flight modes that are not checked will not be displayed in the flight mode list and it is not possible to switch that flight mode via the ground station to prevent misuse/triggering that could result in the drone crashing. Also, fewer flight modes are displayed allowing the operator to switch modes more quickly.

The LGC categorizes flight mode storage into APM mode, which stores data into the ArduPilot flight controller (firmware version AP4.5.0 or above), and Local mode, which stores data into the computer's local storage. The storage mode is automatically recognized by the LGC system and cannot be changed.

⚠Some flight modes are restricted by the ArduPilot system and can't be

changed to show/hide; the storage mode is preset for VTOL and multi-rotor to show the flight model.

(1) Click the LGC icon on the upper left corner, select "Vehicle Setup", and then select "Mode Selector" in the left menu bar, the following interface will appear:



(2) Check the desired flight mode and click "Save" to complete the setting. When the storage mode is APM, the data will be written to the FLTMODE_GCSBLOCK parameter of the flight controller; Local mode will be saved locally.

⚠When you enable the mandatory checklist, it is recommended to check FBWA and Manual flight mode, which will be used in the operation.

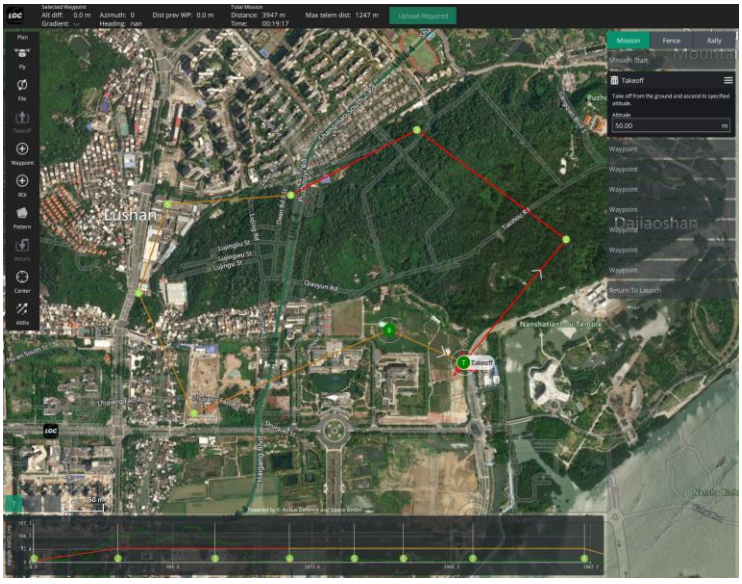
4. Altitude Correction

The Altitude Correction function is used to modify the route altitude with one click to reduce the possibility of collision caused by wrong route altitude

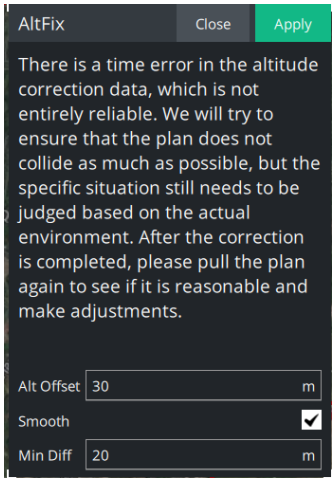
setting.

> ⚠This function is based on the altitude map data from the network, which may have some error with the actual, and cannot be 100% correct. It only serves as a pre-processing function to help detect and handle the fact that the altitude of some waypoints is lower than the acquired altitude data. Please do not put excessive trust in its processing results, which can be confirmed by checking the waypoints after correction.

(1) After entering the waypoint planning screen, after plotting the course, or pulling the aircraft's course.



(2) You can click the altitude correction button  in the sidebar to enter the correction interface (as shown below).

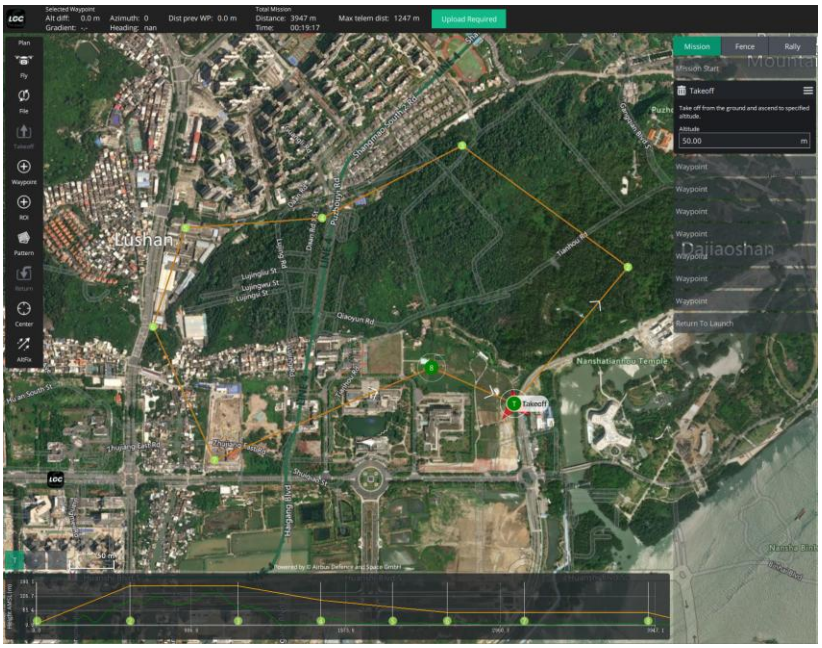


The Altitude Offset is the amount by which the known altitude data should be shifted upwards to prevent the altitudes from being too close together and causing problems;

The **Smooth Over** option smoothes the waypoints as continuously as possible after correction;

The Minimum Smoothing Difference is the value above which the difference in altitude between two waypoints will be involved in the calculation;

(3) As above (1) figure, you can see some waypoints are lower than the altitude data, enter the completion in the altitude correction window and click on the **Apply** button to complete the altitude correction, you can see the correction effect through the AMSL altitude chart below and view the waypoint altitude as shown below.

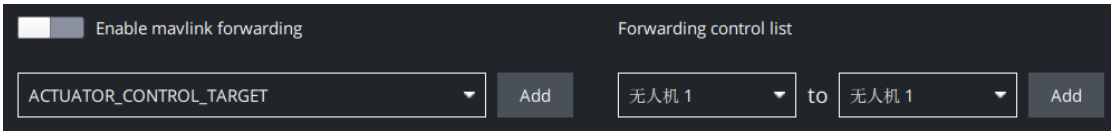


(4) Confirm the route is normal, then upload the route.

5. Mavlink Forwarding

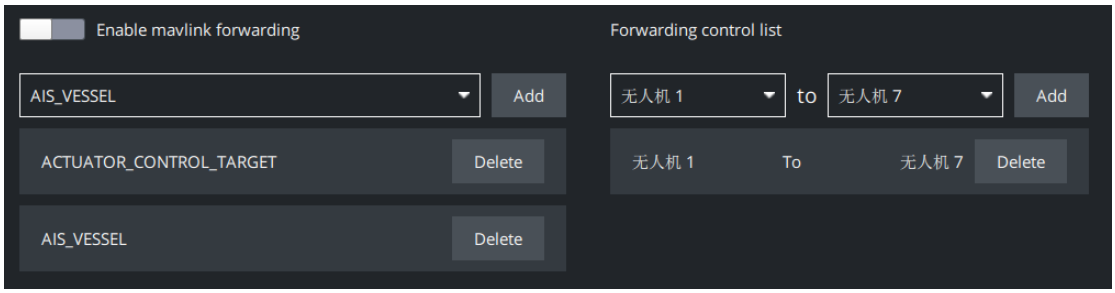
This function is used for mavlink data forwarding between drones, it supports selecting corresponding mavlink messages for forwarding, and it supports specifying drones to forward to certain drones, mainly used for testing data, assisting inter-drone communication, etc. This function is currently a test function, the message designation is only for testing. Currently, it is a test function and only supports global settings for message designation.

(1) Click  icon on the upper left corner, select **"Application Settings"->"Forwarding"**, you can see the interface as below



(2) On the left side, click the drop-down box to select the corresponding message, and click "Add" (you can add more than one forwarding message).

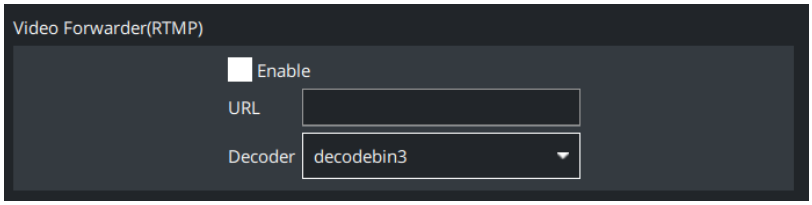
(3) On the right side, select the drone for forwarding, the left drop-down box is for **message sending**, and the right drop-down box is for **message receiving**, in which the All in the drop-down box represents all drones (Note: If the same drone is used for both sending and receiving, the message will not be sent to itself again), and the setting is completed, as shown in the following figure.



(4) Click the "Enable Mavlink Forwarding" slider to start forwarding.

6. RTMP Video Streaming

LGC supports to push the captured video stream to the target IP or live broadcasting platform, so as to share the video remotely. This function is suitable for remote dispatching or command and control centers. The forwarder selects the video decoder.



7. Remote ID Scanner

Remote ID is a technology used to identify and track drones, similar to a license plate for a car. It broadcasts key flight data such as identification information, real-time position/altitude/heading, etc. It can help air traffic control to monitor drones to prevent collision with manned aircraft, protect the security of sensitive areas, and so on.

The feature scans the information broadcasted by the remote ID devices over WIFI/Bluetooth signal and display it. For flyers, They can use the information display function to check if their drone's Remote ID module is

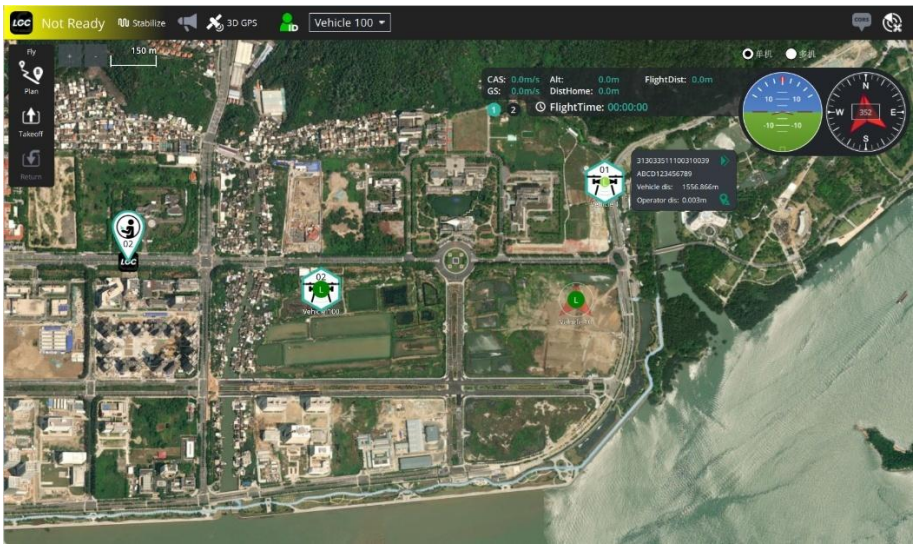
functioning properly and broadcasting information as required. The alert function can also assist in warning about nearby drones, helping to avoid collisions. For the general public or event organizers, it can be used to monitor specific areas for drone activity. If drones are detected, their real-time location can be viewed, and the operator can be quickly located.

> ⚠ This feature is only applicable in scenarios where drones have been equipped with Remote ID modules as required by regulations and are broadcasting identification information.

Viewing Methods

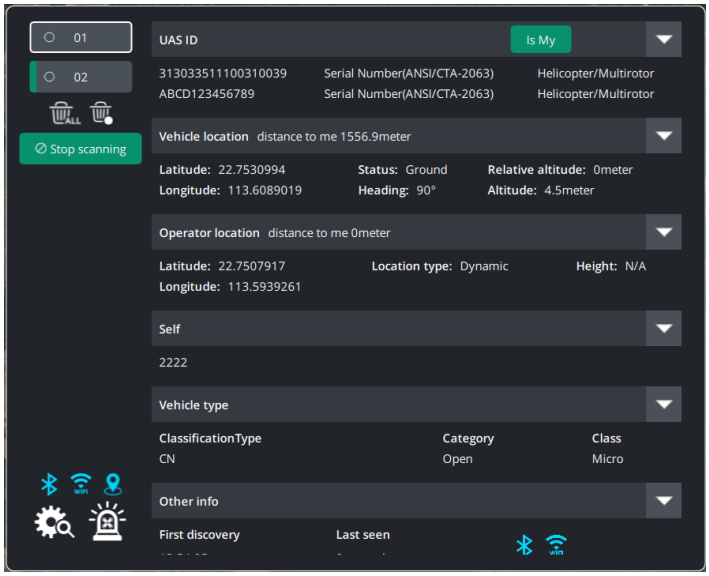
The scanned drones are available in map and list view:

① The map format is shown below, with the drone  and the operator  displayed in the flight view, and brief information about the drone appearing on the right when the mouse is introduced to the drone icon (clicking on it on mobile). Click on  to quickly locate the operator of the drone, for scenarios with a lot of drones, and click on  to see detailed information about the drone.



② The list can be accessed via the icon for a particular drone, or via the icon in the upper right corner of the flight view, as shown below.

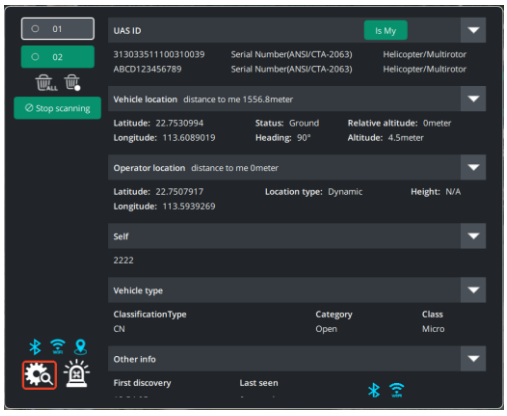
- The left side lists all the drones that have been found, and the system automatically arranges the serial numbers, clicking on one of the serial numbers, the right side will display the detailed information of that drone.
- Clicking on Is My will mark the drone as my own, which will be reflected in the list as 02 to differentiate my drone from others'. Your own drones will no longer show the icon in the map.
- Click to clear all drones and rescan. Clicking on will only clear drones that have not been updated in the last 5 minutes (they may have flown away, landed and shut down, or other possibilities).

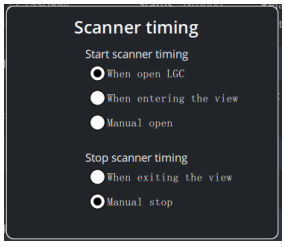


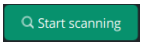
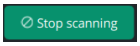
Search Timing

The default is to start scanning and searching automatically when the LGC ground station is turned on, and to stop scanning manually.

Click  in the upper right corner of the flight view to enter the list page, then click  in the lower left corner to set the search timing as desired.





- "Enter View" means when the above list screen is opened, "Exit View" means when the above list screen is closed.
- "Manual On" means clicking the  button, and "Manual Stop" means clicking the  button.

Bluetooth and WIFI Selection

- Bluetooth is on by default. Tap the icon at the bottom left corner of the list interface to enable or disable Bluetooth search, blue color means it is on.
- WIFI is off by default. Tap the icon at the bottom left corner of the list screen to enable or disable WIFI search, blue color means it is on.

Map Display

Map display is enabled by default. Click icon at the bottom left corner of the list interface to enable or disable map display, blue color means it is enabled.

Proximity Alarm

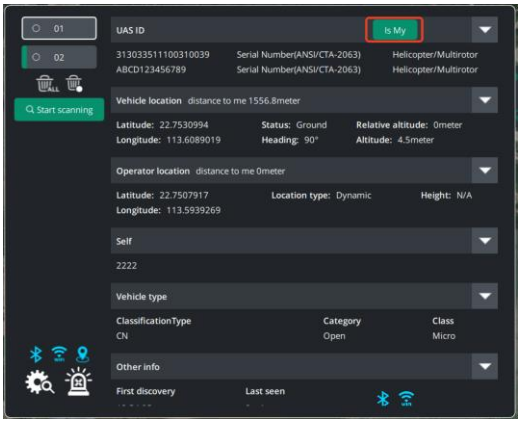
This function is used to remind "me" to be careful when my drone is too close to other drones, the system will automatically emit an alarm sound to avoid accidental collision.

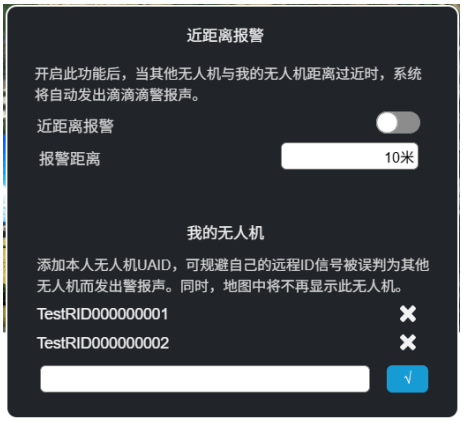
This function is not enabled by default. Click the icon at the bottom left corner of the list interface, and then click the button in the pop-up window to enable or disable the function.

If the function is enabled, you need to configure the alert distance.

If the function is turned on, in order to avoid their drone's remote ID signal

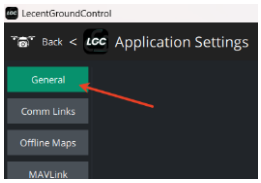
being mistaken for other drones and continuously sounding an alarm, users must mark their drone ID. Users can choose to fill in the ID directly in the window and click on the  button, or click on the  button on the right side of the list.

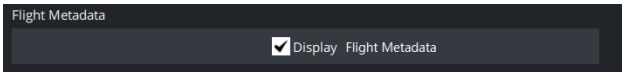




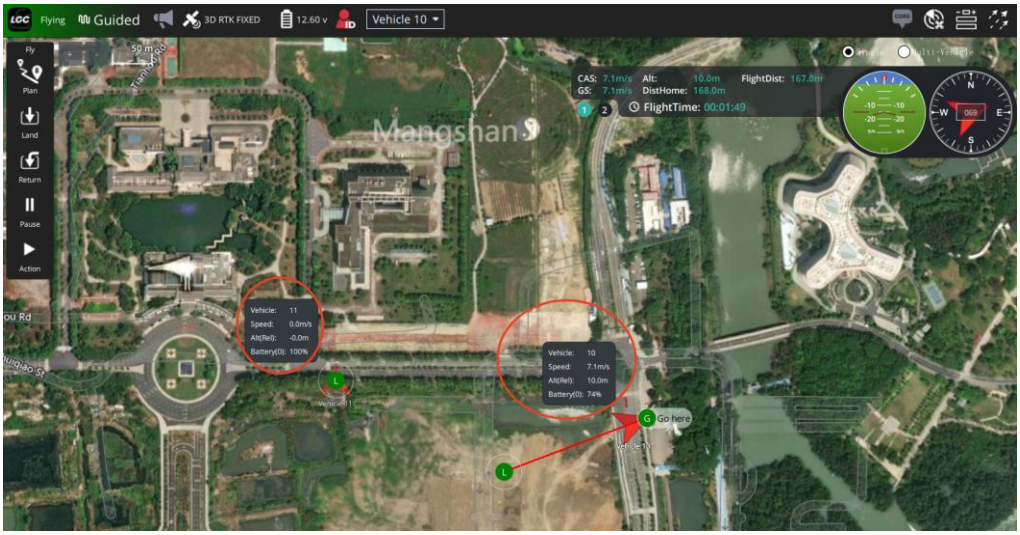
8. Real-time flight data of multiple drones

Click  icon on the upper left corner, select **"Application Settings"->"General"**, find the flight view data in the right interface, and check "Show flight data".





Then you can see the information of flight altitude, speed and power next to the airplane icon in the flight view. When the ground station connects and operates several UAVs at the same time, it can also pay attention to the data of each aircraft at the same time. As shown in the figure below.



9. Cluster Formation Function

> ⚠Cluster formation function is only applicable to vertical take-off and landing fixed-wing/multi-rotor/fixed-wing; this function is still in the process of improvement. The LGC will display the Cluster Formation control when multiple aircraft are accessed.

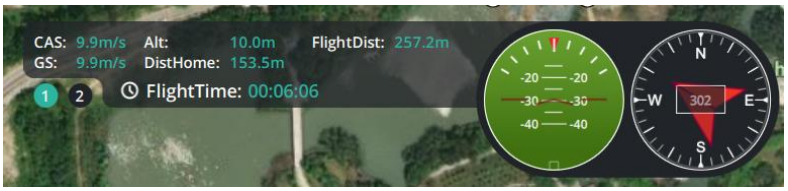
For detailed setting method, please read “基于 LBA3&LGC 地面站集群编队说明书 V1.3.pdf”

10. Language Description

LGC mainly improves and optimizes the Chinese language translation; some new functions are added and adjusted to take into account the Chinese and English languages, which are not yet compatible with other languages. When switching to other languages, the new interface and functions will be displayed in English.

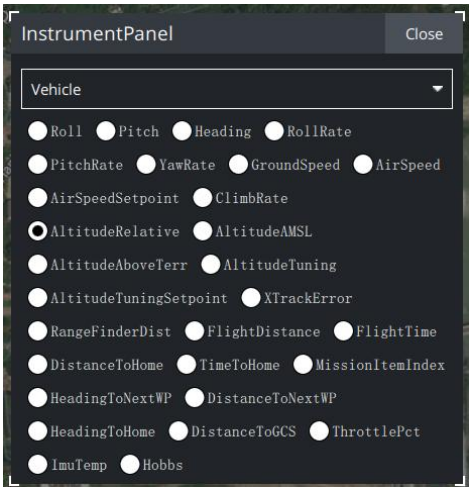
11. Flight Dashboard

Flight Dashboard is divided into two interfaces, ①Basic Dashboard Interface and ②Expanded Dashboard Interface.



You can click ①/② button to switch interface.

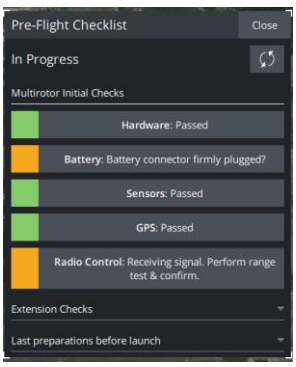
The data columns of the basic dashboard are fixed, no change is provided; in the extended dashboard, the throttle and flight are fixed, and the other four can be adjusted to other data. To modify, click the corresponding position, select the corresponding display value in the pop-up selection box, and finally click "Close".

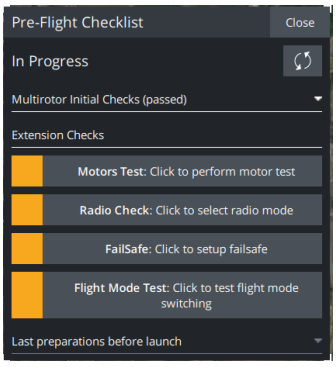


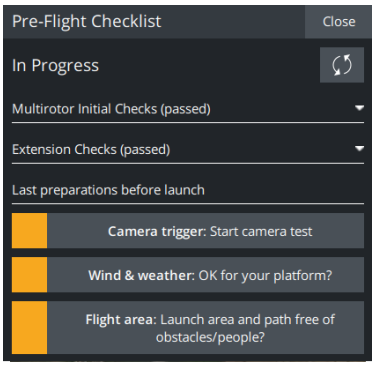
⚠LGC instrument panel does not support vertical instrument panel.

12. Mandatory checklist before takeoff

By default, LGC adopts the mandatory checklist to guide new pilots to complete the pre-takeoff setup and inspection according to the safety procedures. Click on the Mandatory Checklist icon on the left side of the flight interface.







Initial Check:

- Hardware check: manually confirm that the propeller installation direction is normal.

- Battery: Manual check.

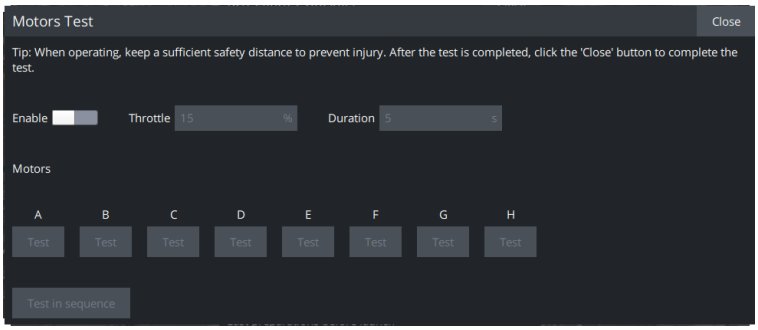
- Sensor: System self-check, no need to operate.

- GPS:System self-check, no need to operate.

- Remote control: Manual click to confirm.

Extended check:

- Motor check: manual motor steering and status test is required.



① Click to enter the motor test interface;

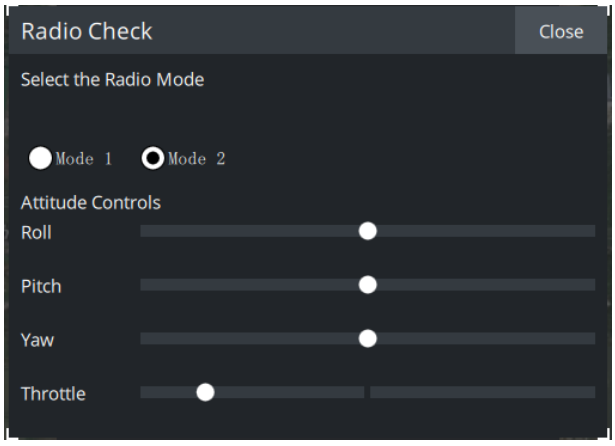
② Click "Test Confirmation" to confirm the start of test operation. Set the test throttle (10-15% recommended) and duration 0-2S;

③ Click the test button under the motor serial number, the corresponding motor will start to rotate;

④ Click "Close" after confirming the status of all motors.

⚠When operating, please fix the rotor arm and keep a safe distance to prevent accidents and injuries.

- Remote control confirmation: manually confirm whether the remote control mode and joystick control mapping are correct; the system is not involved in the check.



- Fault protection: Set battery low voltage protection, LGC ground station

communication loss protection, RC link fault protection (throttle fault protection) and geo-fencing according to actual needs.

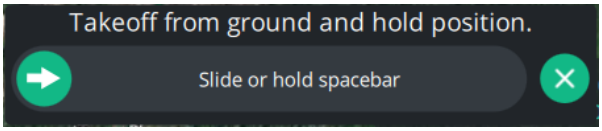
- Flight mode check: select to switch to unlock the flight mode before takeoff (unlocking is not possible in some flight modes).

Final check confirmation:

- Camera Trigger Test: Used to check the camera status when mapping application; if no camera, click "Close".

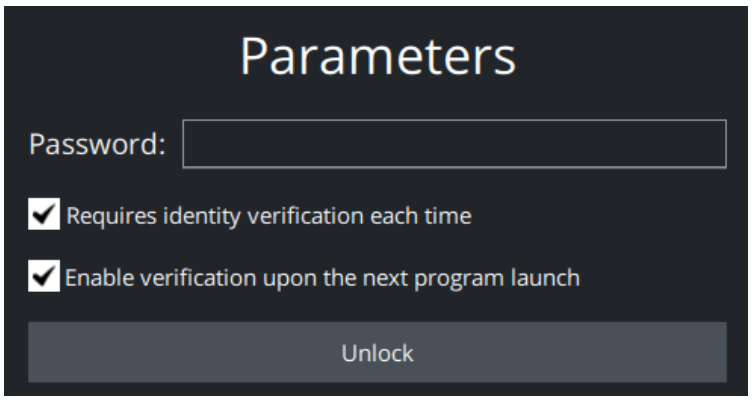
- Flight area: Manually check whether the airplane is placed in the obstacle-free area, waiting for the takeoff operation.

- After completing the pre-takeoff check, pull the slide bar to the right to confirm the takeoff and start the current mission.



13. All parameter table encryption

After entering the parameter setting interface, the following picture will be displayed, and you need to enter the password (default: Lecentcuav).



You can enter the configuration file to set the password and set whether to enable the password or not. Configuration file path:

C:\Users\Users\AppData\Roaming\LecentGroundControl.org\LecentGroundControl.ini

Configuration content:

[LGC_PARAMS_AUTH]

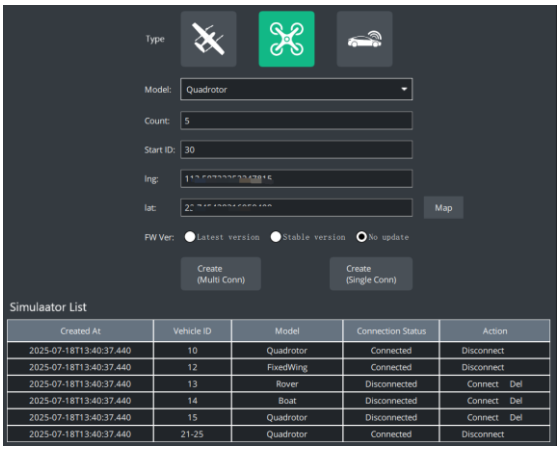
PARAMS_PWD=Password

ENABLE=Enable or not (true/false)

14. Simulator

LGC provides software-in-the-loop simulation of the Ardupilot firmware, which can be used for learning the basic functions of the GCS, simulation exercises for special flight requirements (e.g. formation flight), etc. The simulation function, without the support of hardware module, can complete the flight simulation only in the GCS, which is more convenient for users to learn, and also can reduce the cost and risk of flight test to a certain extent.

Click the  icon in the upper left corner, select "Application Settings"->"Simulator" to enter the Simulator creation interface. Select the **Type, model, longitude and latitude** (you can also select the location from the map), **firmware version type** according to the requirements, and enter the **Count** and **Start ID**, then click the Generate button to generate the emulator and connect it automatically.

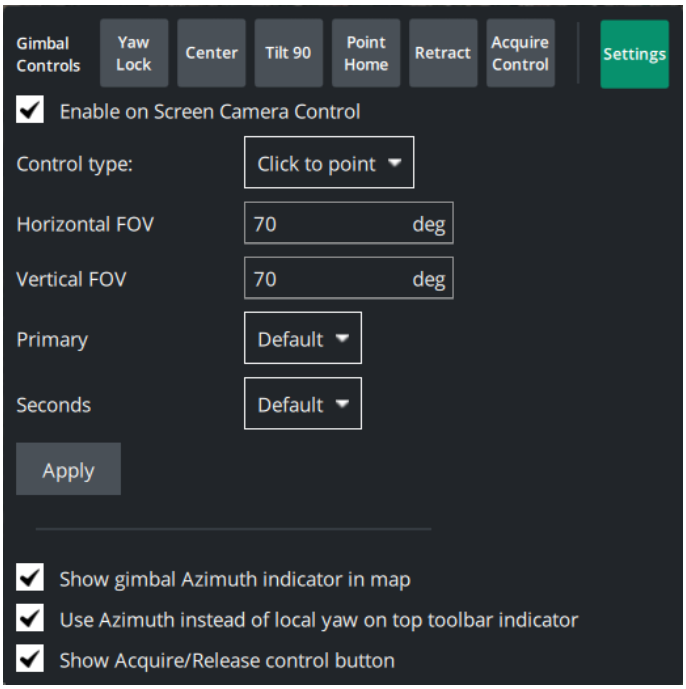


The default count of emulator is 1, only one simulator is generated at a time. If you need to generate more than one simulator at the same time, the generated simulators will be arranged in the vicinity of the specified location in accordance with specific rules, and at the same time, according to your actual need, you can choose to "Creat(Multi Conn)" or "Creat(Single Conn)".

15. Optimize MAVlink pod gimbal control

⚠When the flight control is running ArduPilot 4.5 and above firmware and equipped with MAVlink compatible gimbal camera, the gimbal and camera can be controlled by LGC; when LGC detects the MAVLINK gimbal it will show the

control interface; this function is still in the stage of improvement!



- "Yaw Lock/Follow": control whether the gimbal keeps the earth coordinate system yawing to the target (lock) or follows the carrier yaw movement (follow)

- "Center": center the gimbal back (move it into MNT1_NEUTRAL_X, MNT1_NEUTRAL_Y, MNT1_NEUTRAL_Z)

- "Tilt 90°": the gimbal camera is vertically down.

- "Pint Home: point to the airplane home position.

- "Retract": move it to the roll, pitch and yaw angles maintained in MNT1_RETRACT_X, MNT1_RETRACT_Y, MNT1_RETRACT_Z.

Use the video window to control the gimbal:

- Select the "Settings" button

- Check "Enable on Screen Camera Control" and set "Control Type" to "Click to Point".

- Set the horizontal and vertical viewing angle of the camera

- Adjust the video playback frame to the maximum, and click anywhere on the screen, the PTZ will move the center point to the target orientation according to the field of view.

- Pull the right zoom control bar to control the gimbal for zoom control.

- Seeing light and thermal imaging can be switched through the primary and secondary source settings

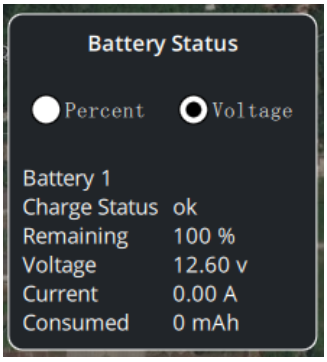
16. Video decoder

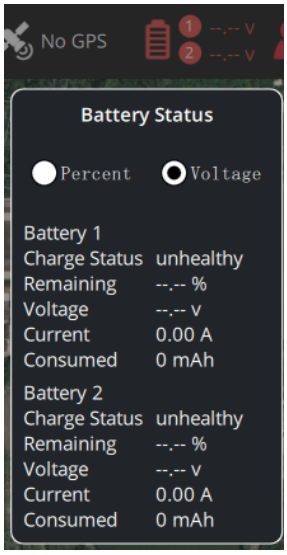
To accommodate some H264 video streaming devices, the LGC video

encoder has been changed from decodebin3 to decodebin.

17. Battery percentage/voltage switching

In order to take into account the intelligent development of the industry and the actual situation of some users using non-intelligent batteries, the battery information area of the LGC flight information column provides two modes to choose from, supporting the user to choose to display the percentage of power or voltage.



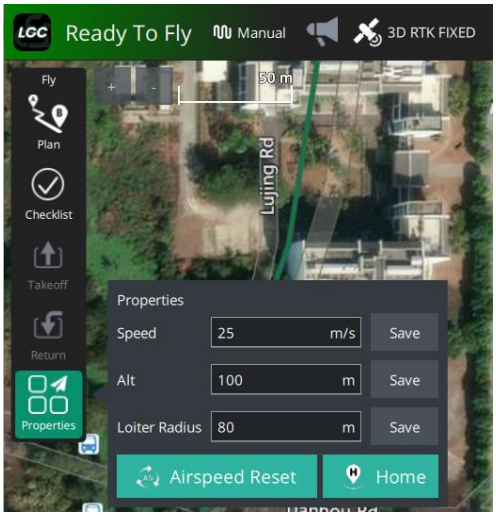


18. Optimized for vertical take-off and landing fixed wing

Real Time Properties

This setting is only available for fixed wing and vertical takeoff and landing UAVs with Ardupilot firmware; the setting can be effective in real time. Typical applications are zeroing airspeed and updating takeoff point before flight, and real-time altitude and speed changes during flight.

Click "Real-time Properties" in the sidebar of the main interface, you can see the interface as below, where Speed is the **cruise speed, Altitude** is the relative altitude, **Hovering Radius** is the radius of hovering during the flight, **Airspeed Zero** button can reset the current airspeed data, and **Start Point** button can set the current position of the drone as the home point.



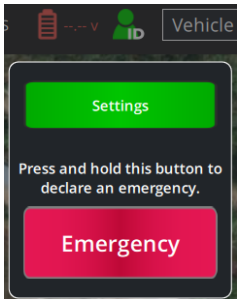
Wind Vane and Wind Speed Indicator

For fixed wing/vertical takeoff and landing fixed wing characteristics (Ardupilot firmware), LGC has added the wind vane indication and wind speed function, which is used to indicate the wind direction and wind speed in the current environment.

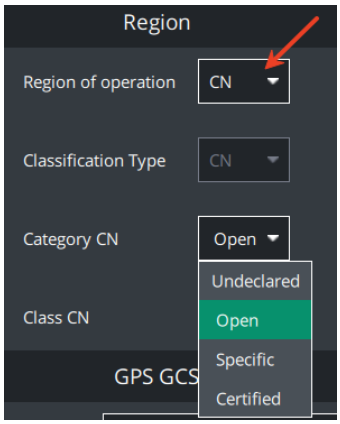
19. Optimize remote ID information setting

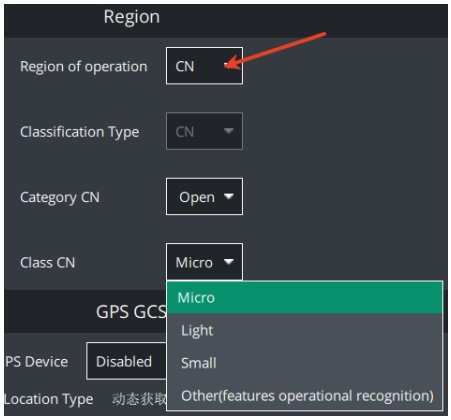
Click  icon on the toolbar in the main interface of the system to show

the shortcut configuration portal, click "Information Setting" to enter (you can also enter through the menu: LGC icon>Application Setting>Remote ID).



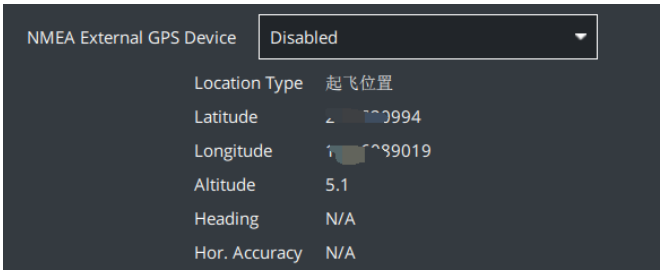
When "CN" is selected for the operation area, the operation category and UA level options will be displayed according to the China policy.



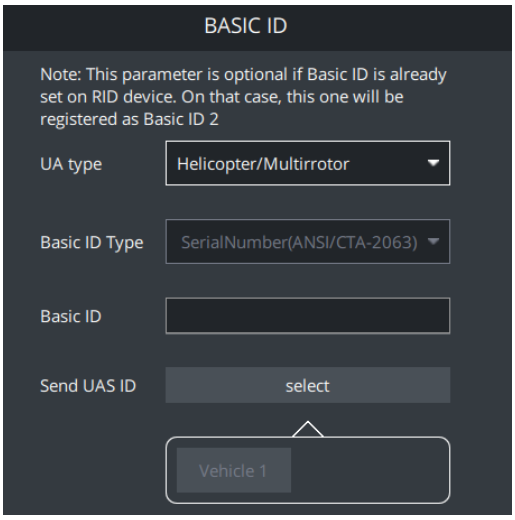


When "CN" is selected as the operating area, location type selection is not supported. If user has external NMEA GPS device, please select NMEA GPS device connection port and baud rate; if there is no corresponding device, NMEA GPS device field can be set to "Disable". According to China's policy, the system will prioritize to get the dynamic positioning data of the device , if it fails

to get the data, then the system will use its own positioning data (the type of which is dynamic), and if it fails to get the data, then it will use the aircraft takeoff position.

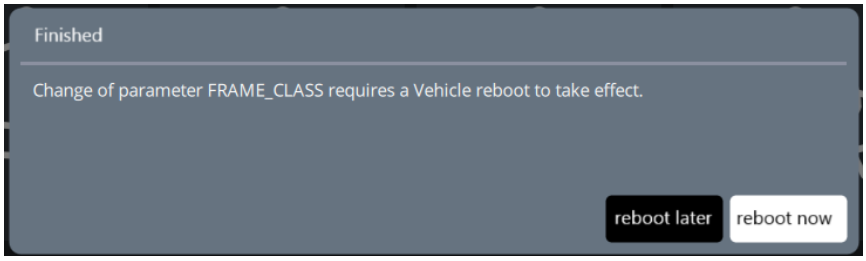


Aircraft ID sending function is optimized to send to specified aircrafts on demand instead of continuously to all aircrafts. Only "SerialNumbr(ANSI/CTA-2063)" is supported. UAS ID sending is only supported for Ardupilot controllers.



20. Reboot Reminder Window

After modifying the key parameters, you need to restart the airplane to take effect, in this case, you can click restart directly in the reminder window, or you can choose not to restart.

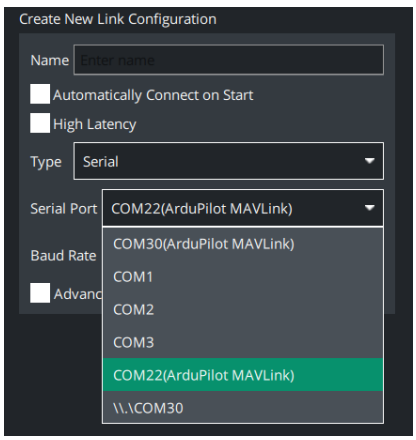


21. Fixed route planning bug in QGC Chinese mode.

LGC fixes the bug that the existing QGC version cannot plan routes under Chinese interface language.

22. Fix the problem that some serial ports cannot be found in connection configuration

After the ground station device connects to the flight control hardware through the serial port, when adding the communication connection in the ground station program, the required serial port will not be found in the feature scenario, this problem has been solved.



23. Fix the problem of losing the configuration menu of other drones after one drone disconnecting.

When the ground station connects to multiple drones at the same time, disconnect one of them at this time, and then you will find that the setting menu of the rest of the drones is lost. This issue has been fixed.