Flight Logs Tool

User Guide

SwellPro

Note: Flight logs tool will help you identify the cause of aircraft accidental damages.

v1.1 – 2022.9

Content

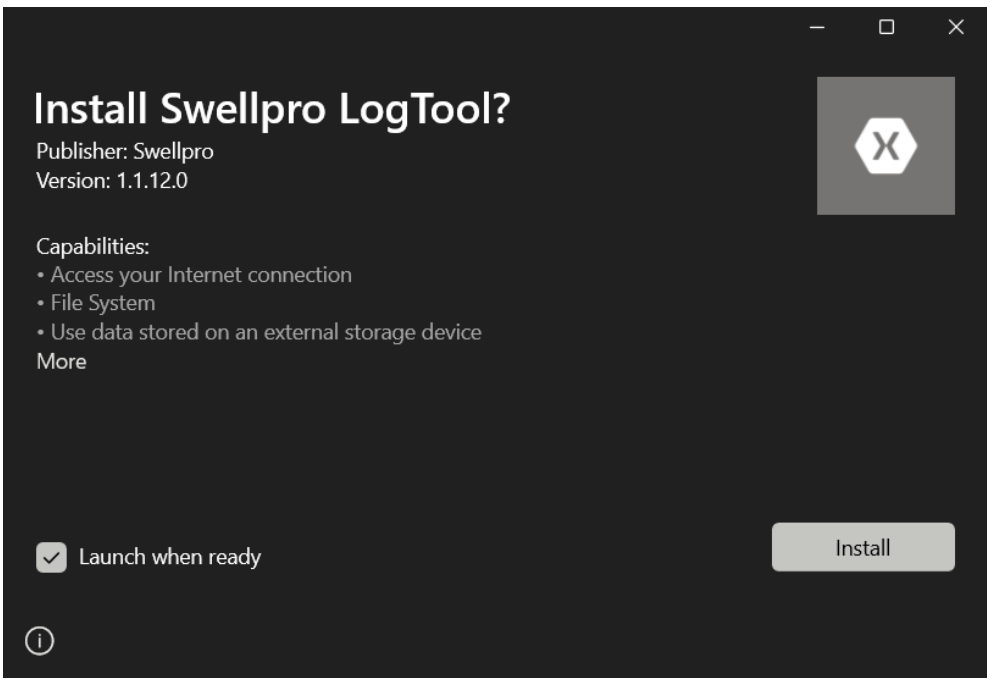
Install

Flight logs tool is compatible with Windows 10/Windows 11 with x64.

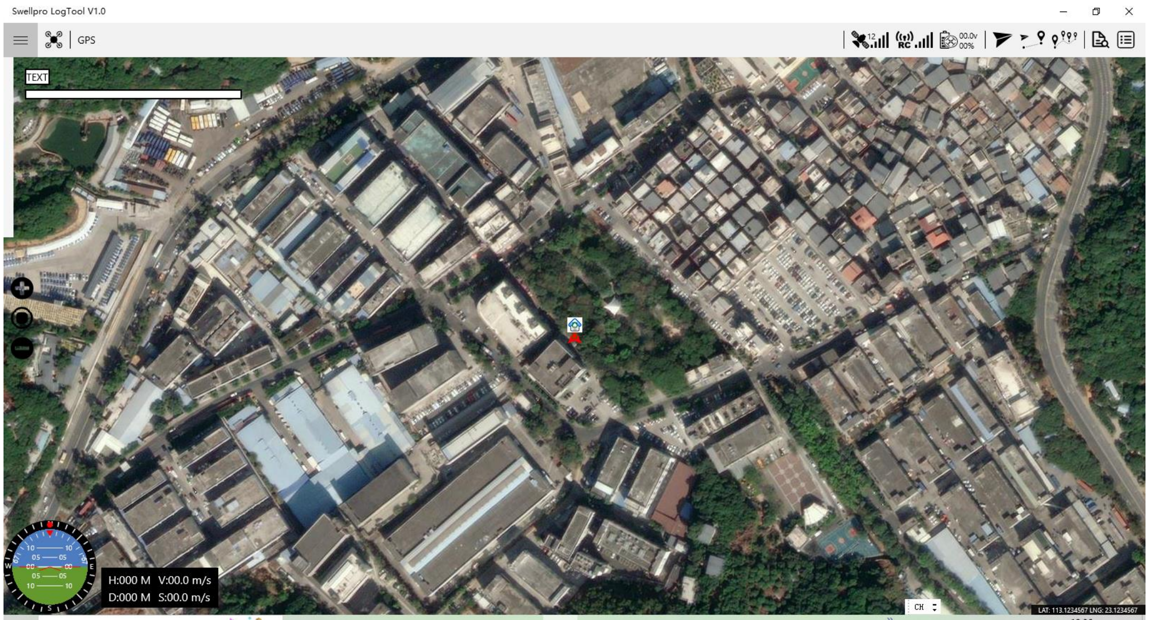
Install

1. Download the zip file named “SwellproLog Tool”. Remember to unzip the file before you install.
2. Click“Installation”.

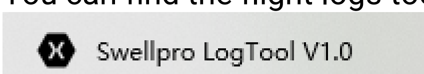
3. Click Install.



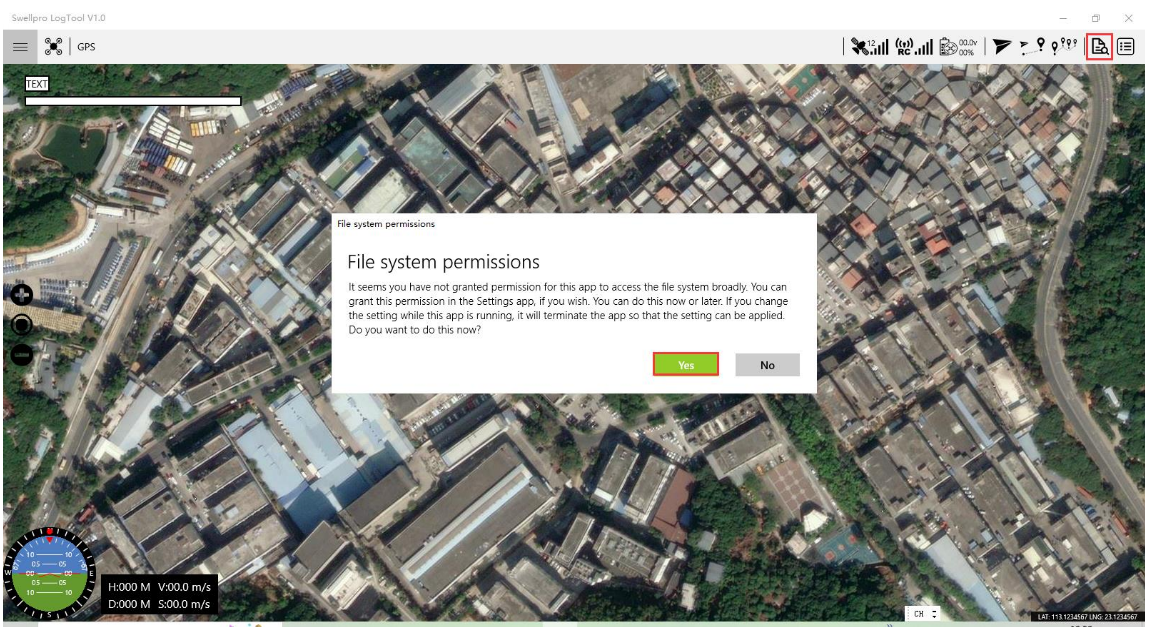
4. The software will open automatically after finishing the installation.



5. You can find the flight logs tool in the Window Start menu for later use.



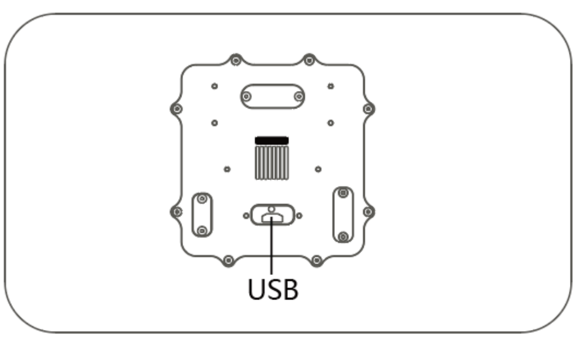
6. For the first use, a system prompt might show up. Click “Yes”. It will bring you to the Windows system settings. Please turn on all the permission for the software to function properly. Then restart the software. You are now ready to use the tool.



Logs

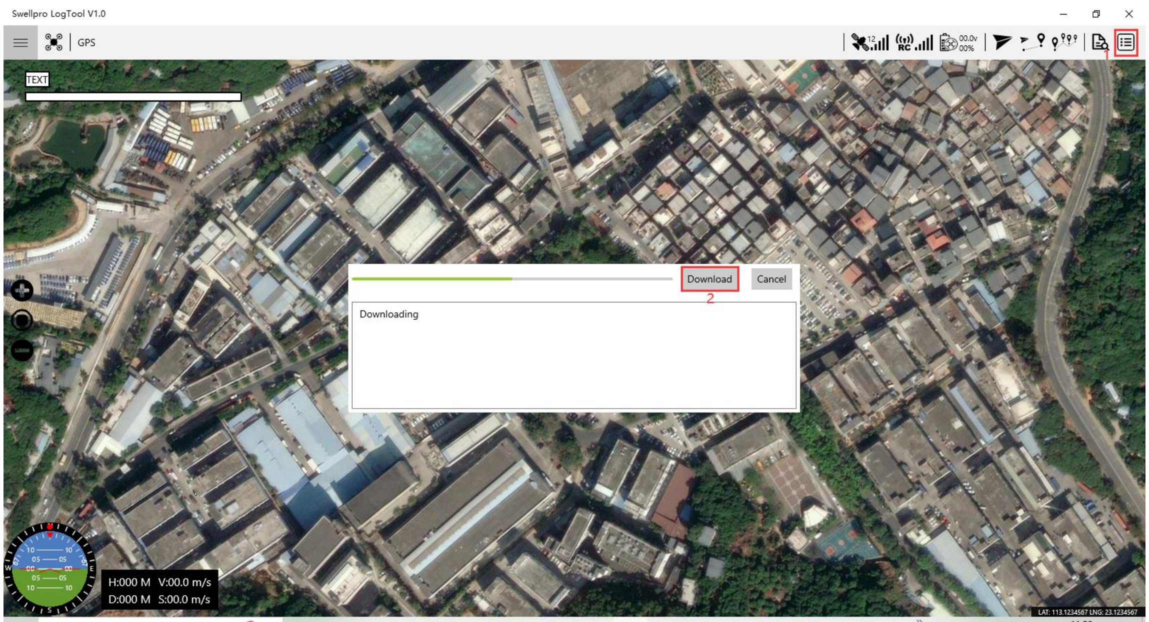
Download Logs

1. Disassemble the USB cover plate on the bottom of the aircraft.



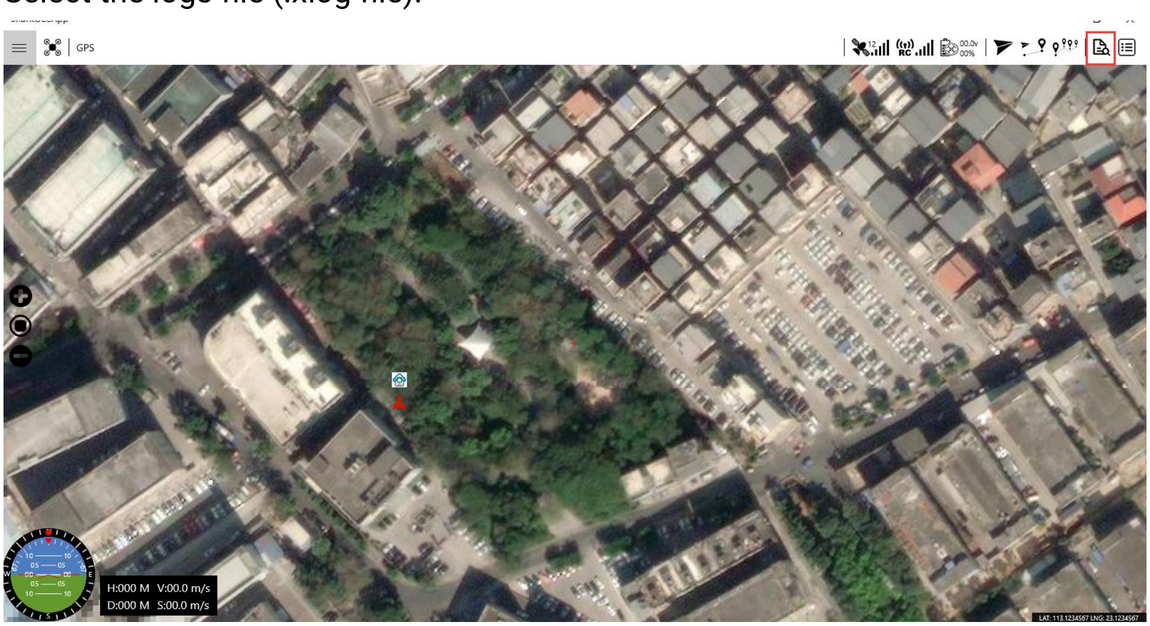
2. Power on the aircraft. Connect the Micro USB port to a PC using a Micro USB cable.

3. Open the tool. Click the “Logs Download” button on the very top right corner. A prompt will show up. Click “Download”. Select a download location after finishing the download.

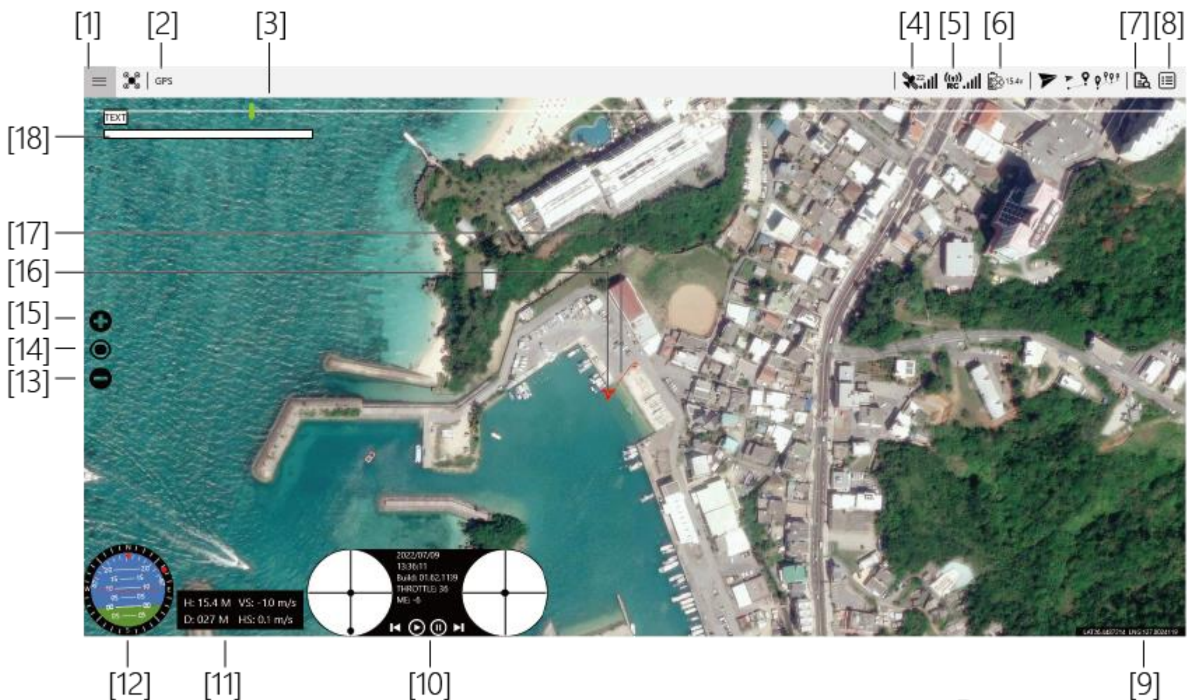


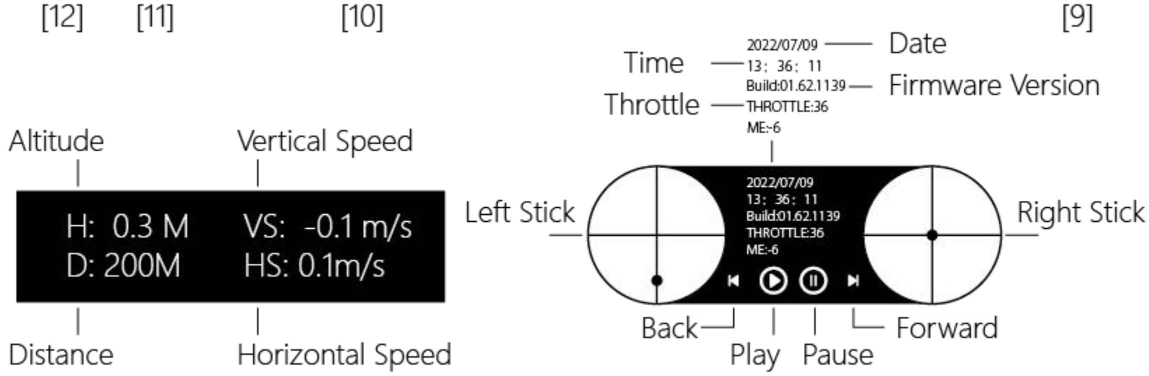
View Logs

Click the “Import Logs” button on the top right corner (the one with the magnifier). Select the logs file (.xlog file).



Tool Interface





1. Switch Views
2. Flight Mode
3. Progress Bar
4. GPS Signal
5. Remote Control Signal
6. Flight Battery Voltage
7. Import Logs
8. Logs Download
9. Longitude & Latitude
10. Control Sticks
11. Flight Parameter
12. Attitude Gauge
13. Zoom Out
14. Locate Aircraft
15. Zoom In
16. Aircraft Location
17. Flight Path
18. Prompt Message

Logs Analysis

Flight logs tool allows you to access and visualize the flight data, including data from:

- Barometer
- Compass
- Flight Battery
- GPS
- Gyroscope
- Accelerometer
- Motor ESC

Analyzing the data allows you to better understand what happened during the flight and provides insight into finding the cause of a flight accident.

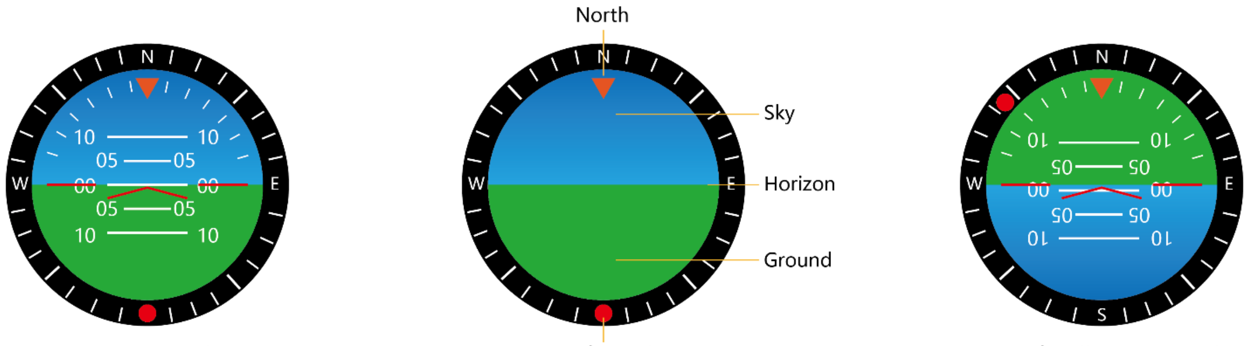
Map View

1. **Open the flight logs tool. The default view is the map view.**
2. **Click Locate Aircraft button to locate the aircraft.**

Map view uses a North-up orientation.
North – Up; South – Down; West – Left; East – Right.

3.1 Attitude Gauge

The attitude gauge allows you to observe the aircraft's attitude during the flight.

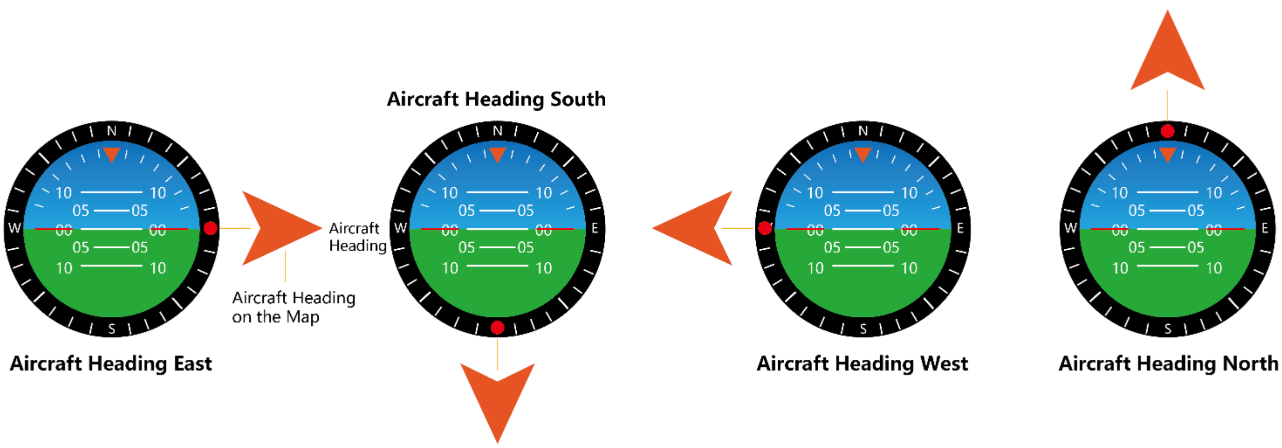


Hover Attitude

Aircraft Heading

Aircraft Roll over 180° with the bottom facing up

Aircraft Heading： Red dot indicates the aircraft's heading.



Tips: as a starter, you can familiarize yourself by connecting the aircraft to a PC and playing with the aircraft, and observing the attitude changes as you rotate the aircraft.

3.1.1

If

- there is a locked control,
- throttle value is 0,
- very minor changes in the altitude value,
- attitude gauge changes in a regular manual.

Then

It might be the pilot was grabbing the aircraft, and there is no flight accident.

3.1.2

If

- the aircraft is unlocked,
- aircraft has a certain altitude,
- aircraft rollover showing on the attitude gauge.

Then

It indicates the aircraft was crashing.

3.2 Observe the Control Stick

By observing the control stick movement, you can get a sense of the pilot's proficiency and psycho in operating the aircraft. You can also look for any faulty control on the control stick.

⚠ **Faulty control:** 1) Pilot didn't control the aircraft to avoid the obstacle. 2) Lock the aircraft during the flight. (The aircraft will start free falling, the attitude gauge will show rollovers, and the throttle value will be 0.)

3.3 Observe GPS Signal

3.3.1 The number showing on the GPS signal is the actual number of satellites the aircraft's GPS is receiving. (It's different than the GPS signal showing on the remote control or App.) If the GPS signal number is greater than 10, there is enough GPS signal for the aircraft to position itself.

3.3.2 Aircraft's position and time data are obtained from the GPS receiver. If no GPS signal is established, both the position and time data would cease to update. As shown below, the bottom left corner is the time data, the bottom right corner is the position data. If both data cease to update, it indicates the GPS receiver malfunctions.

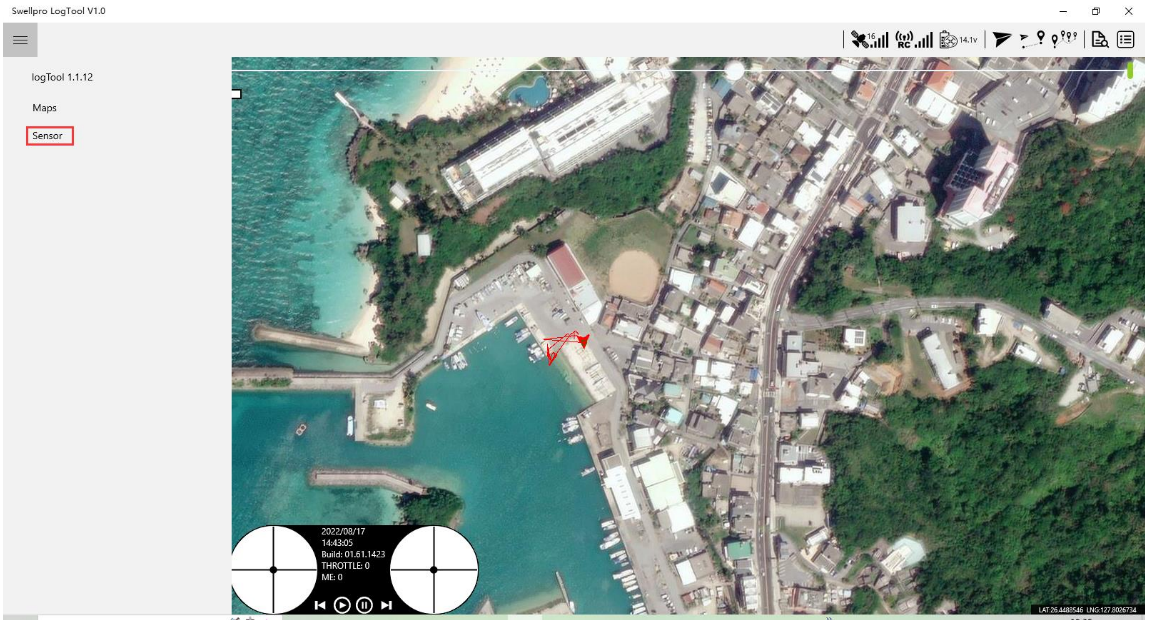
3.5 Observe Aircraft Surrounding

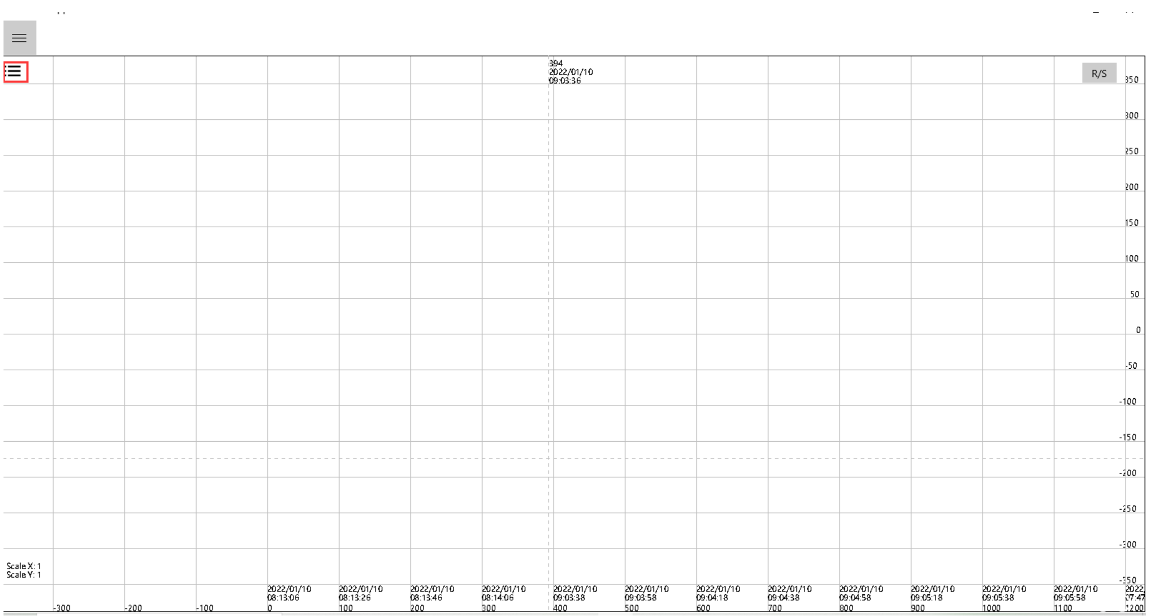
On the map view, you can observe the aircraft's surroundings. If there are trees or buildings on or near the crash location, it's most likely the aircraft crashed into the trees or buildings. (You can also use Google Map for a clearer view of the crash location)

Sensor View

Click , then select "Sensor" to switch to sensor view.

Click  to show the list of sensors.





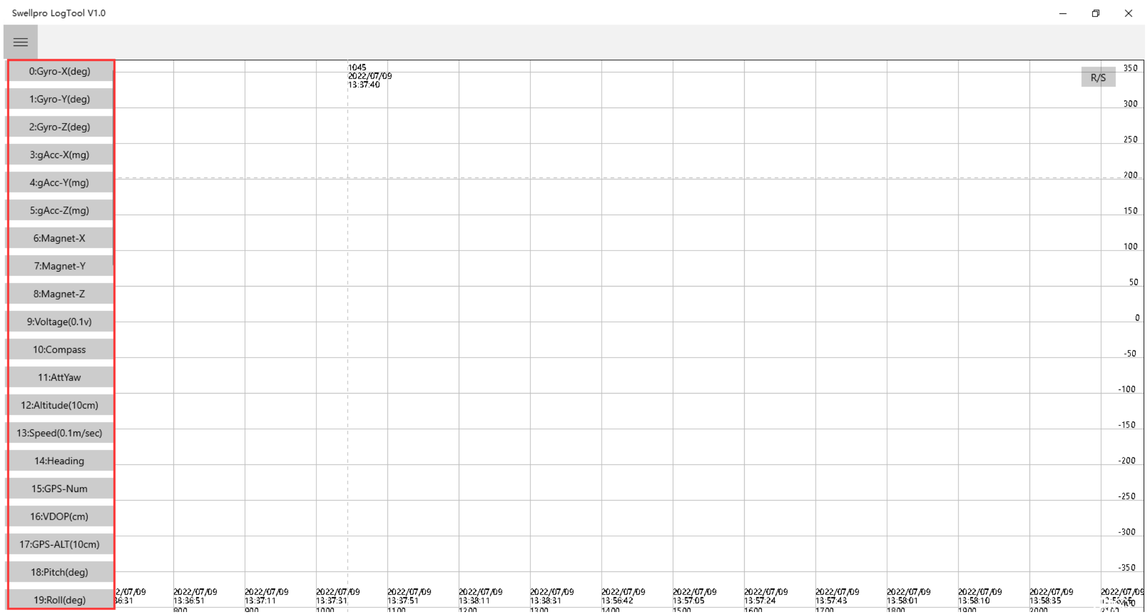
There are 54 different datasets on the left list. Several key sensor datasets are essential for analyzing the logs.

Tips: It might be extra useful to select and show different datasets together to analyze the logs.

To Use the Sensor View

- Click the dataset on the list to show the data on the graph. Click again to hide it.
- Hover the mouse cursor on the graph to show the value on the curve.

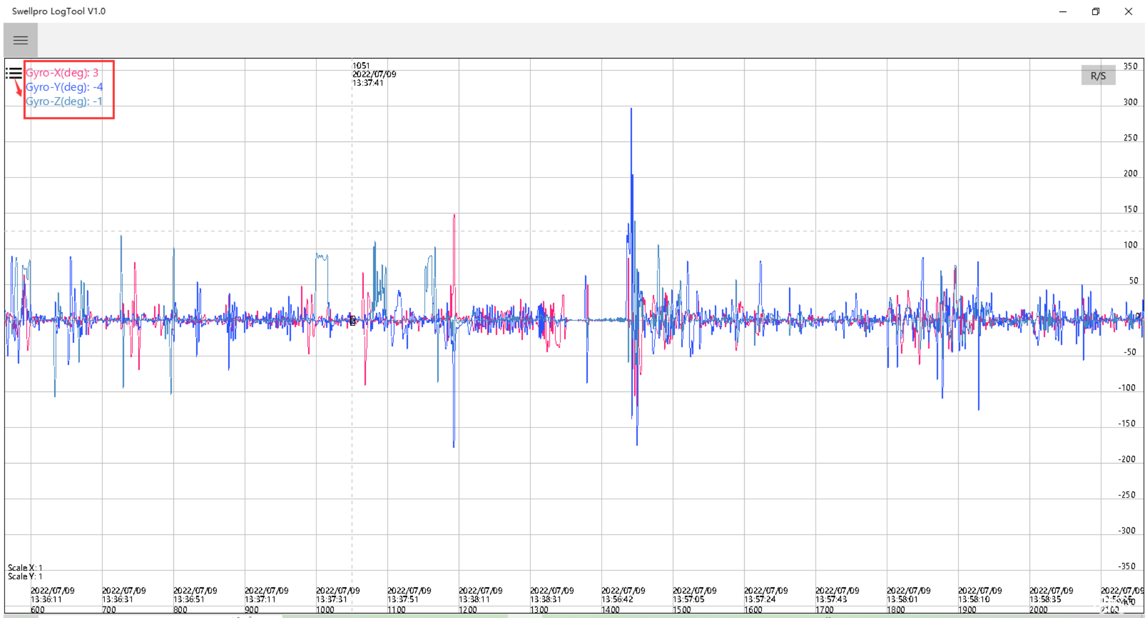
- Hold the left click to drag the axis. Scroll the mouse wheel to zoom in/out the vertical axis. Hold Ctrl and scroll the mouse wheel to zoom in/out the horizontal axis. The selected dataset will show in the top left corner.
- If the logs are playing on the map view and you switch to the sensor view, you would not be able to manipulate the datasets on the graph. It's recommended to stop playing the logs on the map view, then switch to the sensor view.



0-2 Gyro， Data from Gyroscope X, Y, Z axis：

- The three values are 0 in normal circumstances with plus or minus less than 500.
- If the value is between 500 and 1000, it indicates there is excessive vibration on the aircraft. It might be due to a problem with the propulsion system, such as damage to the propellers or motors.
- If the value is over 1000 or oscillates greatly, it indicates the gyroscope is not working properly. This might result from a faulty gyroscope, due to the component's quality problem or water ingress problem. The typical case for a faulty gyroscope is that the aircraft ascends itself very fast, the remote control is not able to control the aircraft, and the aircraft is heading in one direction without controlling it.

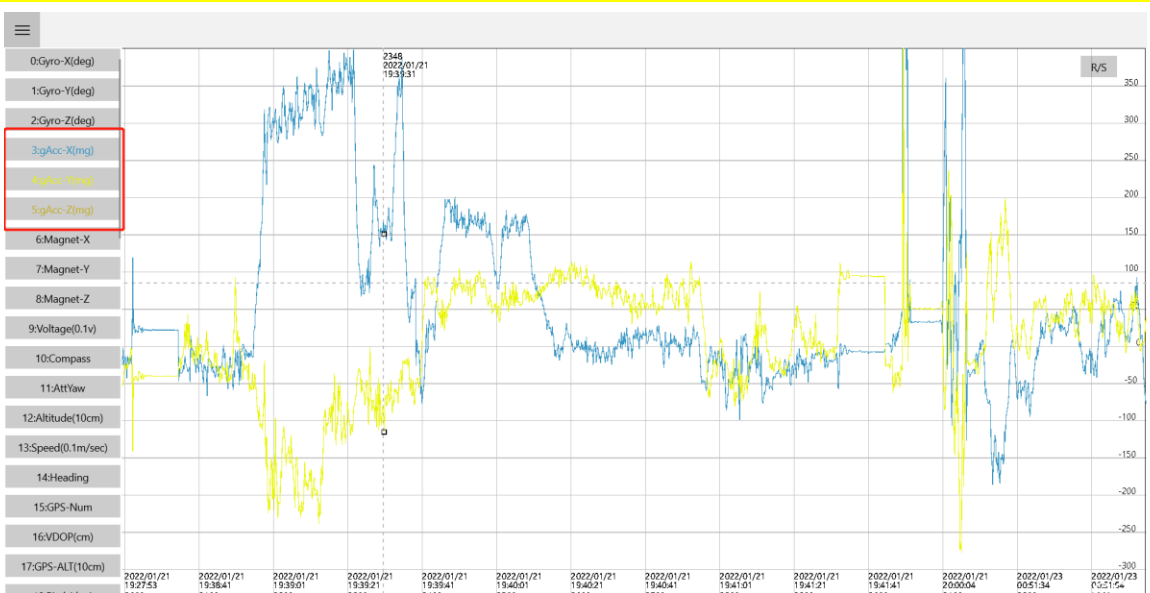
Note 1) If you experience this issue while flying the SD4, switch to manual mode to gain full control of the aircraft. But you need to set the Custom mode to Manual mode on the SDFly App beforehand. 2) This is a rare case.



3-5 gAcc，Data from accelerometer X, Y, Z axis:

- The initial value for X, Y is normally 0, and Z is 1000.
- The normal range for value on the 3 axes is between ± 500.
- Value on the 3 axes greater than ± 500 indicates there are abnormalities on the gyroscope’s level. Usually shows as 1) aircraft is tilting while hovering in windless conditions, 2) aircraft is not able to the main altitude and ascend or descend itself.

Note: This is a rare case.

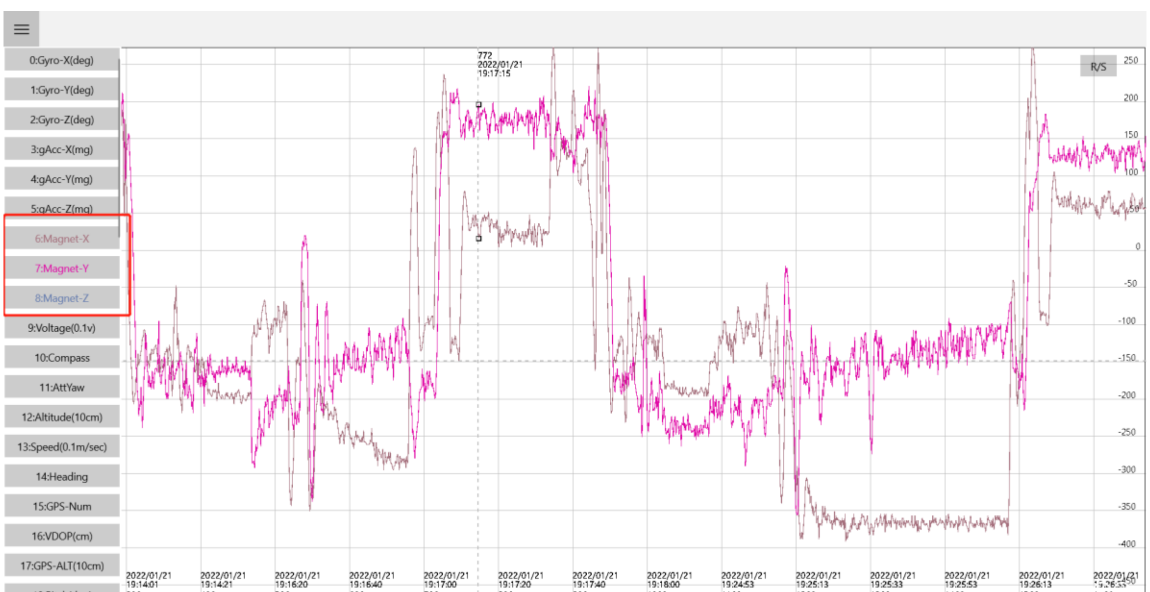


6-8 Magnet, Compass X, Y, Z axis:

- The initial value of the compass is not fixed. The compass value will change with respect to the initial value. The value for rotating the compass for 360° is 800.
- If the compass is broken during the flight, the compass value will stop changing, or oscillate fast back and forth. The aircraft will out of control and head in a certain direction.
- If the compass has interfered during the flight, the compass value will increase to a certain direction. If the aircraft is under GPS mode, it will start orbiting in a bigger and bigger radius until it's out of control.

Note: If the compass is not working properly, switch to ATTI mode and take control of and return the aircraft manually. Do not use the return-to-home function.

Note: To analyze if the compass is working properly: Connect the aircraft to the PC with a USB cable. Turn on the aircraft and SwellproLogTool. Move the aircraft and observe the compass value. If the compass value is not changing or changing greater than the normal range, the compass is broken. Make sure to avoid any magnetic interference while testing the compass.



9 Voltage， Voltage

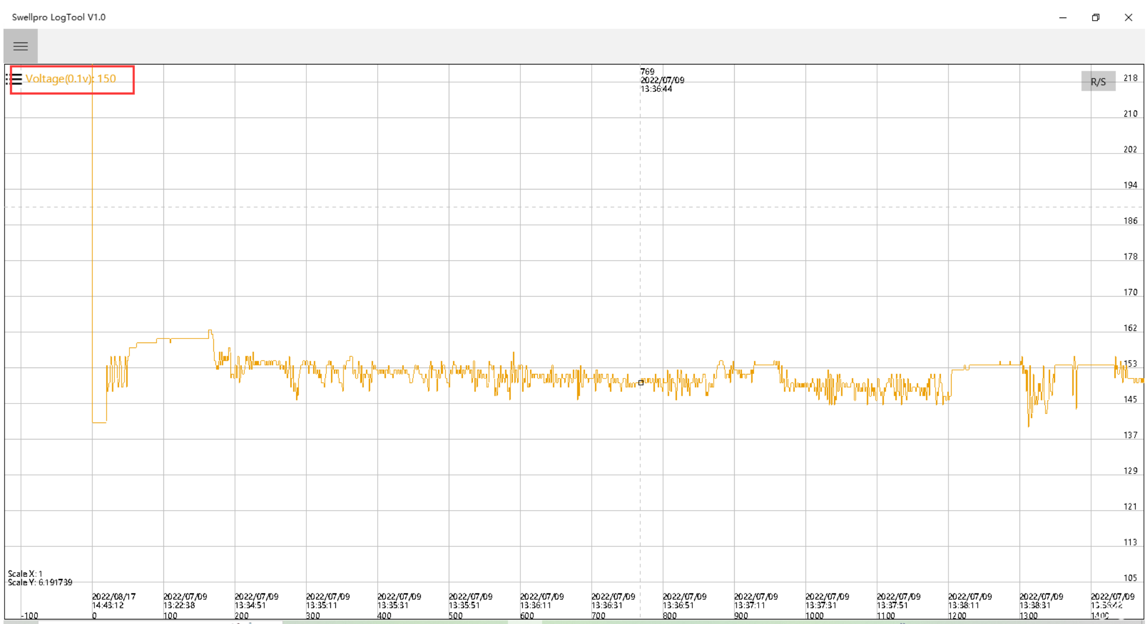
3 key factors to consider when looking at the voltage:

1. Identify if there is a payload attached to the aircraft. (Check if the voltage changes very fast while take-off)

2. Check the voltage during the flight. The landing voltage is 12V for SD4, and 14.2 V for FD1. If the pilot is still manually controlled and flew the aircraft when the voltage reach or below 12V, the aircraft will lose power and fall due to low power.

3. If there is no logs data when the flight accident happens, it might be due to the accidental power lost during the flight. Check if there is any problem with the battery connection, or if there is a problem with the battery itself.

Note: Voltage value 150 refers to 15V on the flight battery.



10 Compass， Compass Angle (It’s better to view the compass angle on map view)

11 AttYaw， N/A

12 Altitude， Barometer Data

The barometer is used to measure the flight altitude, it changes as the flight altitude changes.

If

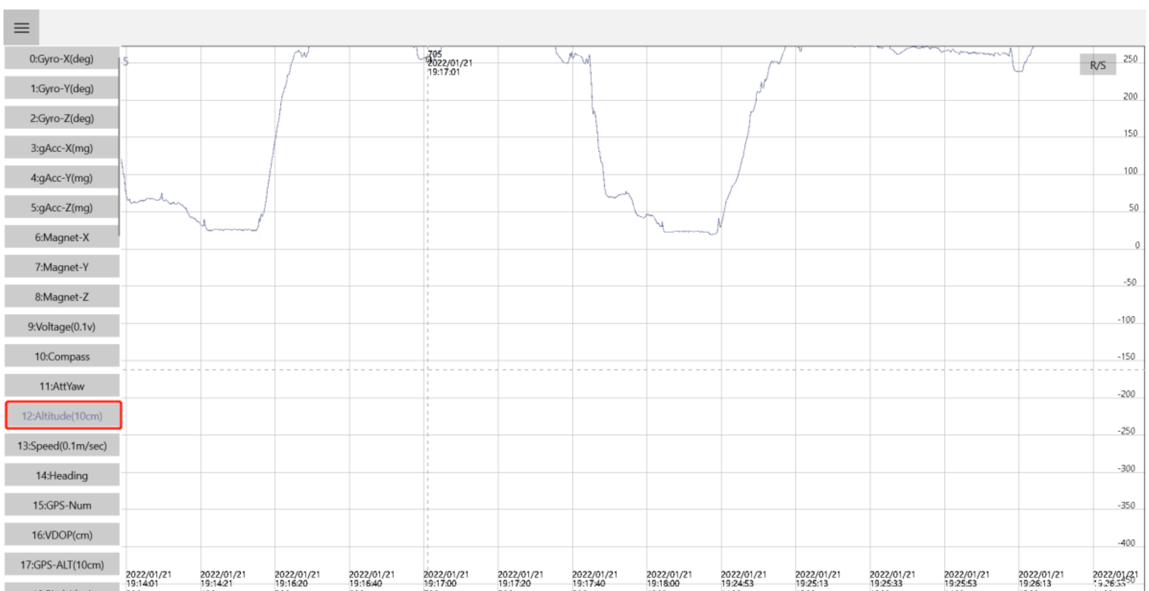
- GPS signal is strong, and the flight altitude remains the same, but the barometer value changes a lot.
- Or flight altitude changes a lot, but the barometer value remains the same.

Then

The barometer is not working properly.

Note: Please stop flying the aircraft and repair it immediately.

If the barometer value changes a lot, and the aircraft is falling, it's due to a faulty barometer. (Usually due to water ingress)



13 Speed, Flight Speed

Flight speed is calculated through GPS, switch to map view for a better view of the flight speed.

⚠ If the aircraft is flying over 10 m/s under GPS mode, the aircraft is out of control.

14 Heading, Aircraft Heading (±180°)

You can combine the aircraft heading dataset with the compass dataset. Aircraft heading has an accuracy of ±10~15°.

Note 1. If the aircraft heading's accuracy is over ±10~15°, you can calibrate the aircraft compass to increase the accuracy. 2. If you observe the aircraft is flying in the wrong direction, land the aircraft and calibrate the compass.

15 GPS-NUM GPS Satellite Number

Switch to map view for a better view.

16 VDOP (cm) N/A

17 GPS-ALT Altitude data from GPS

Compare altitude data from GPS (#17 GPS-ALT) and altitude data from barometer (#12 Altitude). The two datasets should aline together. If the variance between the two datasets is big, the barometer is not working properly.

18 PITCH Pitch Angle

Pitch forward – the value is positive.

Pitch backward – the value is negative.

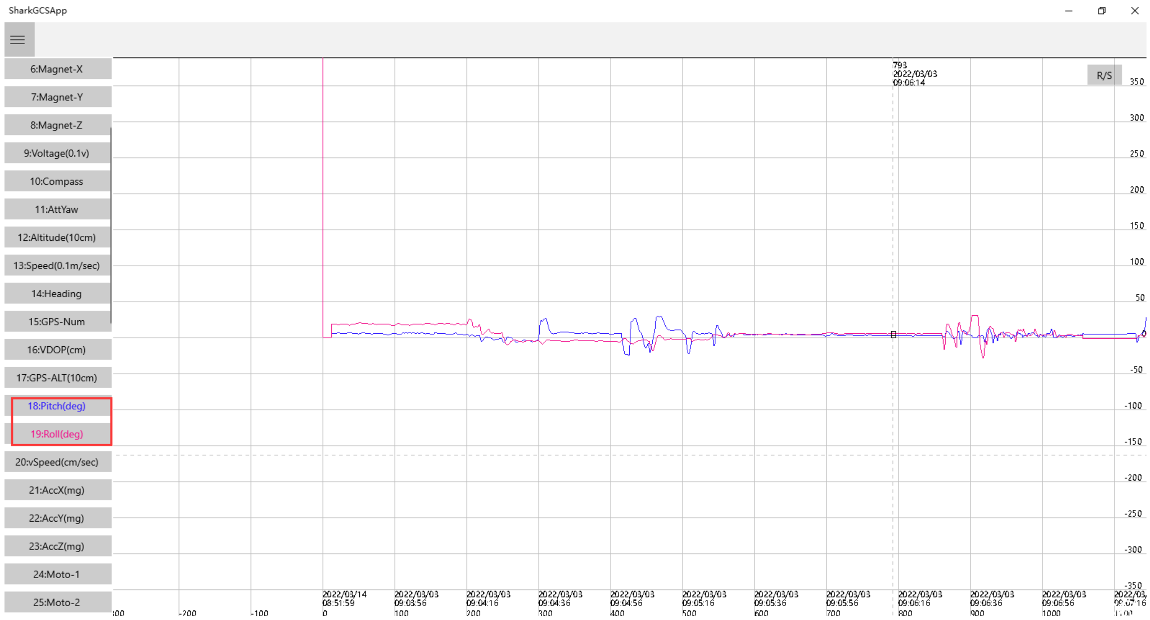
19 ROLL Roll Angle

Roll to the right – the value is positive.

Roll to the left – the value is negative.

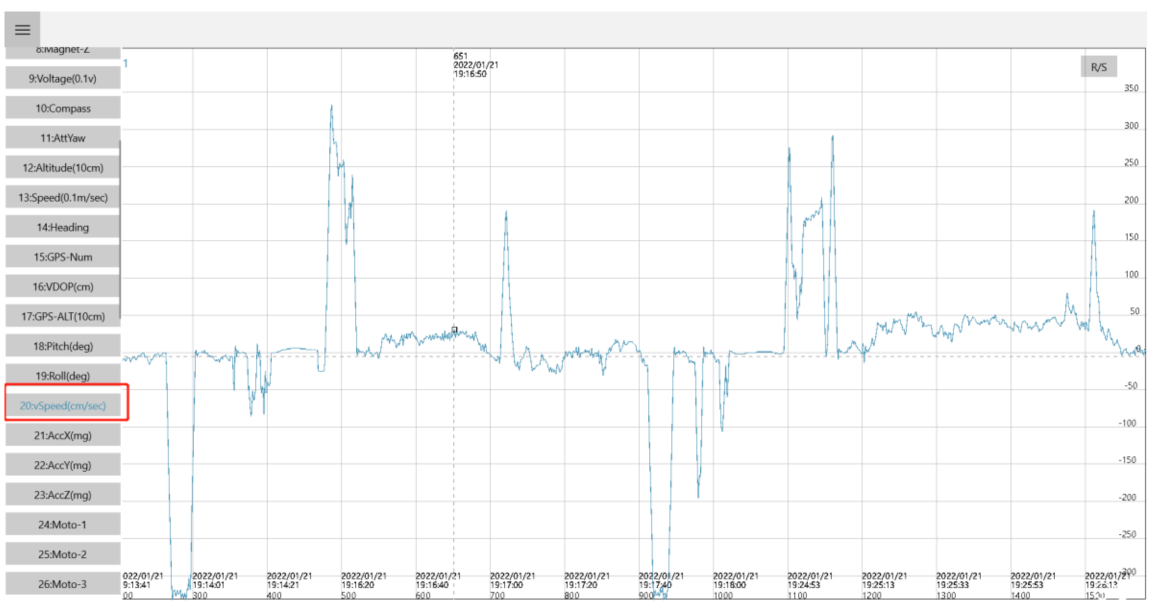
Combine #18 PITCH and #19 ROLL two datasets for analysis. During normal flight, the pitch or roll angle will not be greater than 35 degrees. If the angle is greater than 90 degrees, it indicates the aircraft is rollover; Use the positive and minus sign to evaluate which direction the aircraft rolls over. (For example, if the pitch is +50 degrees, the roll is +50 degrees, and the aircraft rolls over to the front right.)

Note: If the angle changes dramatically in a short period, it might be aircraft has a flight accident and falls from the air.



20 vSpeed Vertical Speed

Vertical speed indicates the aircraft ascend or descend speed. The normal ascend/descend speed is 4 m/s. If the ascend/descend speed is over 4 m/s, the aircraft is out of control. The unit here is centimeters. Ascend – positive. Descend – negative.



21 - 23 N/A

24-27 Moto   Motor Power Output from Flight Controller

Moto-1 is the front left motor.

Moto-2 is the back left motor.

Moto-3 is the back right motor.

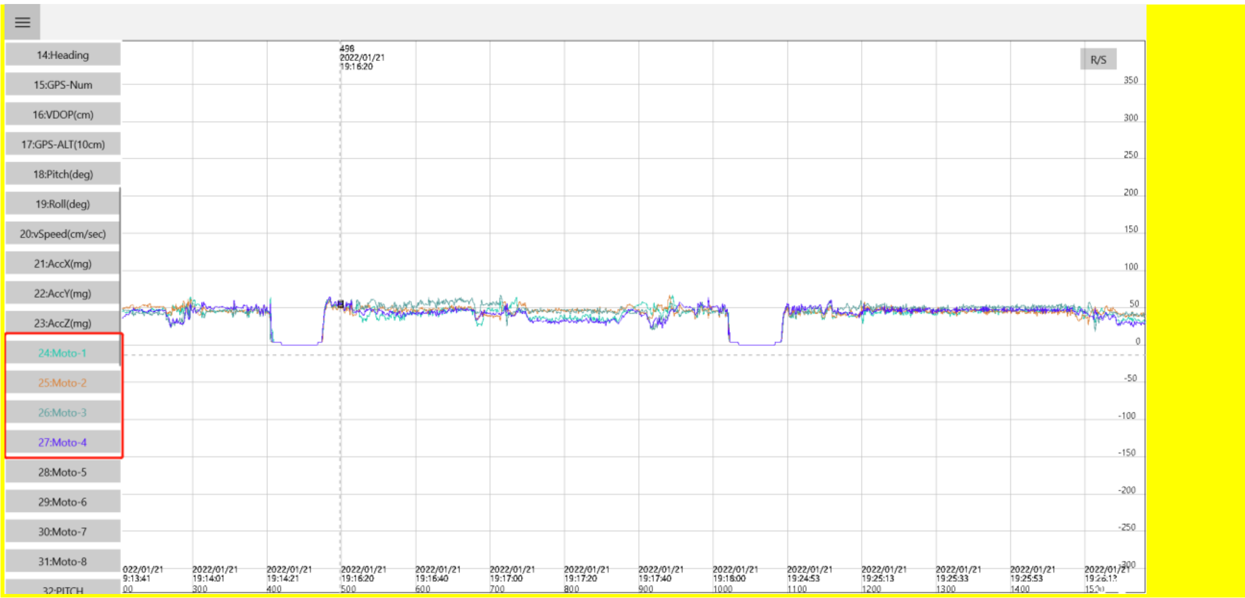
Moto-4 is the front right motor.

Motor values are ranging from 0 – 100; 0 – no power output; 100 – max power output. If 4 motor values are all over 80 (or #44 throttle is over 80), it indicates the power out is severely insufficient. If any single motor's power out is over 100, it indicates there is an abnormality with the motor, and the aircraft would fall during the flight.

You can identify which motor is malfunctioning by analyzing the motor power output curves. Looking at the graph below, three of the curves are aligned together while 1 of the curves reaches 100, this indicates this single motor is malfunction.

⚠ Aircraft would fall during the flight if any of the motor power outputs malfunction. There are 2 possible cases for the malfunction: 1. Propeller fall off from the motor (more likely); 2. Motor ESC malfunctioning (less likely, try to replace the ESC).

⚠ The motor power output is higher when the payload is heavier. Higher motor power output means less power left to supply the motor, hence a higher risk for aircraft falling off due to power insufficiency. Insufficient power can result from 1. The voltage of the flight battery drops rapidly due to high power output to a point when it cannot sustain the high power output; 2. The aircraft encounters a strong wind burst; 3. The aircraft brakes rapidly during the flight.



28 - 43 N/A

44 Throttle， Throttle Output (Throttle output from the flight controller to ESC)

Under normal circumstances, throttle output is between 40-70 while hovering. Look at the throttle output value before and after the accident to evaluate the cause.

FYI:

When SD4 is attached by a 2 kg payload, the flight battery voltage is 13.5V and the throttle output is 80 while hovering.

When FD1 is attached by a 2 kg payload, the flight battery voltage is 14.2V and the throttle output is 70 while hovering.

Use it as a reference to evaluate whether the aircraft has a payload attached or not.

46 – 50 N/A

51 F-RSSI： Remote Control Signal (for SD4 only)

If the remote control signal is 0 when interrupt, it can be used to evaluate the signal connectivity before and after the flight accident.

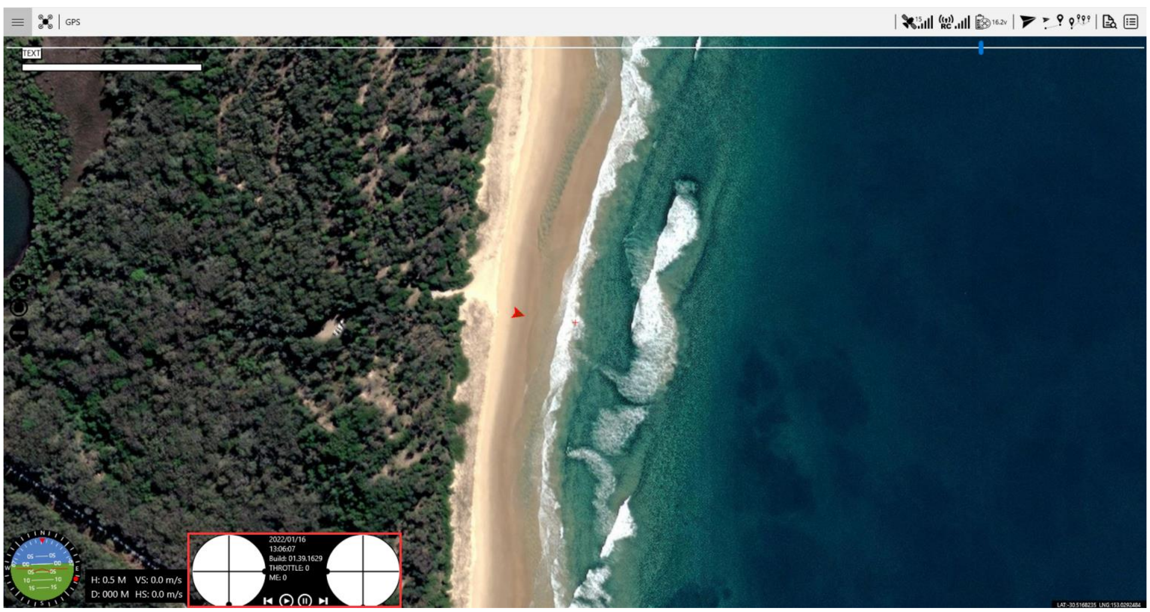
When the aircraft crashes during Return-to-Home, the remote control signal can be used to identify if the RTH is initiated manually or automatically (signal lost RTH).

When the aircraft crashes during the flight, the remote control signal can be used to identify if the aircraft was operated manually or experience signal lost.

52 – 54 N/A

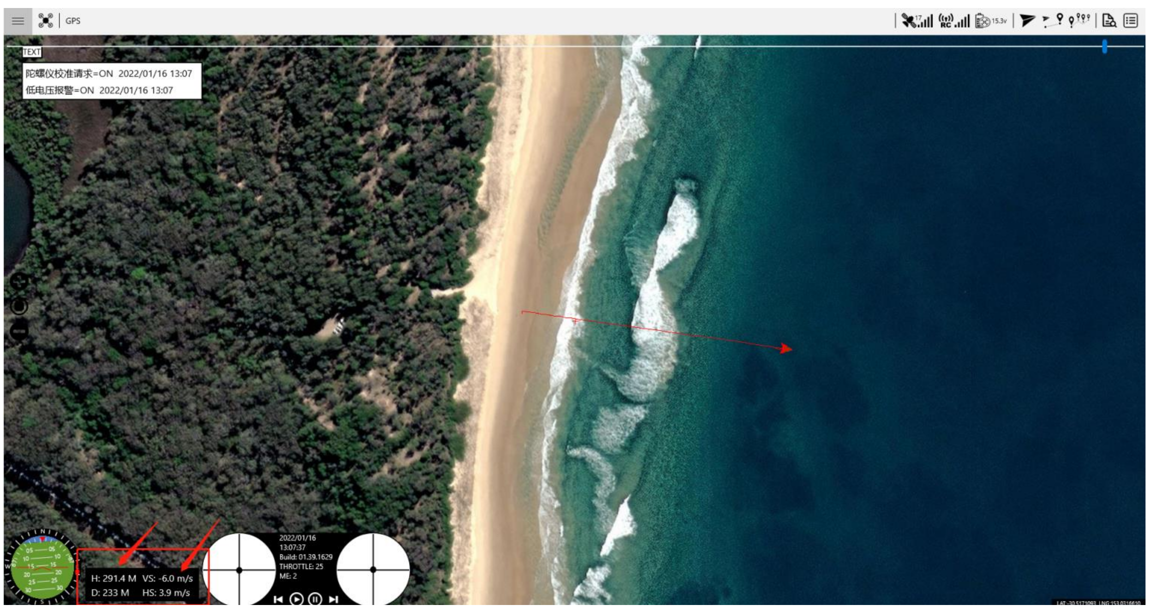
Logs Analysis Cases

Case One: Barometer Malfunction

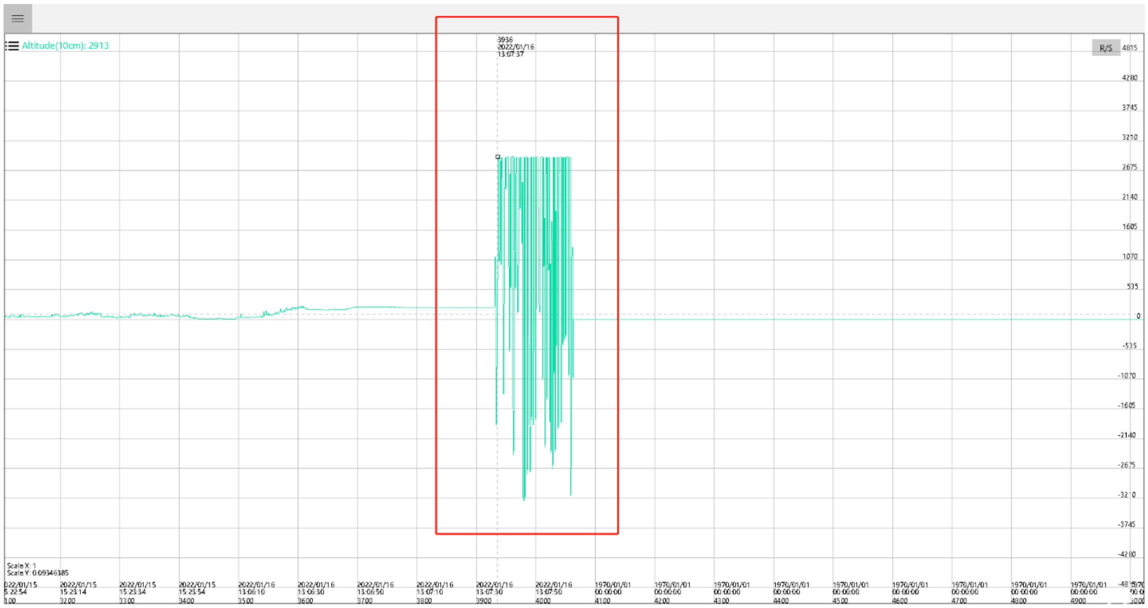


As shown above, the aircraft was unlocked and take off at 13:06:07. After take-off, it ascend to an altitude of 20 meters, then flew forward.

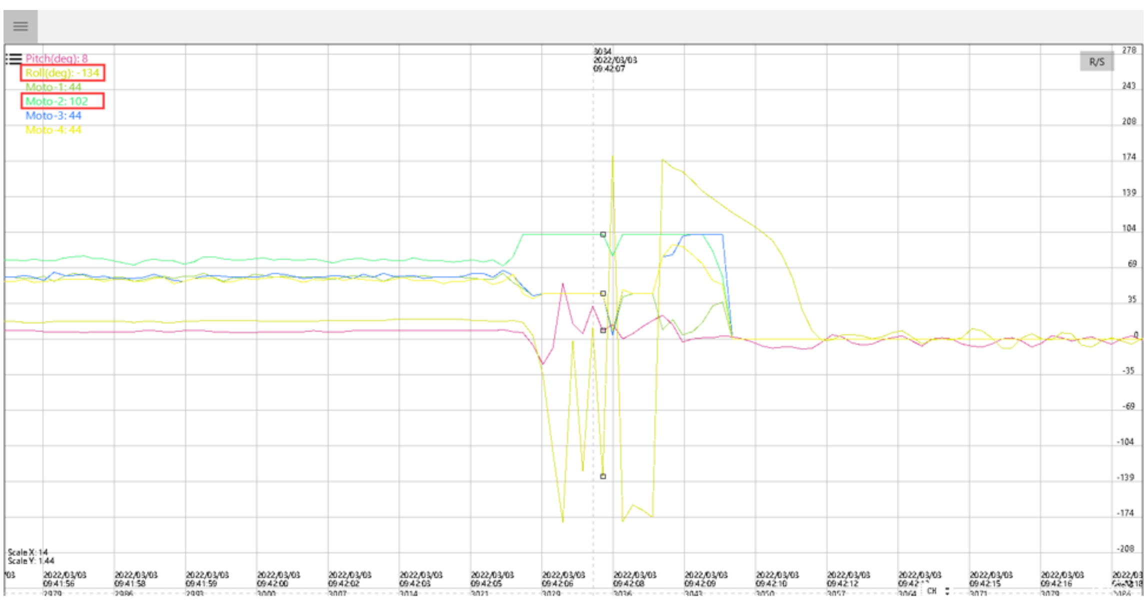
As shown above, by the time 13:07:36, altitude: 20.9m, distance: 228m, all flight data is normal.



As shown above, at 13:07:37, the altitude suddenly ascends from 20 m to 291.4 m, then descend to 100 m, and the vertical speed changes to – 6 m/s. It greatly surpasses the descend speed limit (- 4 m/s). By looking at these flight data, we can conclude that the barometer malfunctioned and it’s the cause of this accident.

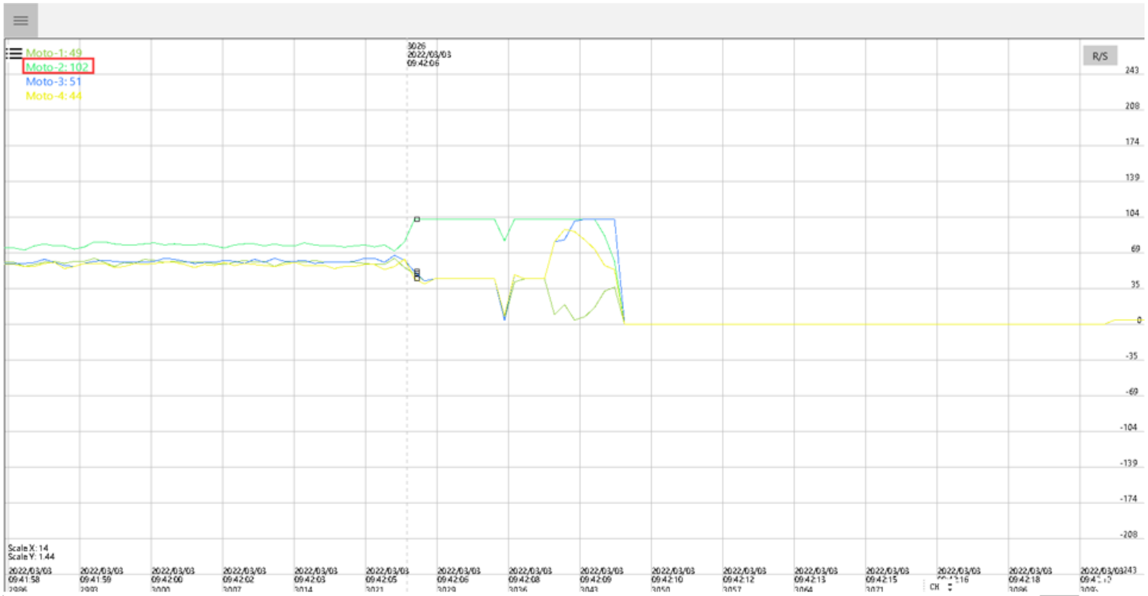


Case Two: Aircraft Power Output Malfunction



As shown above, first, look at the pitch and roll angle, identify which direction the aircraft roll over to and check if there was any malfunction in the power output during aircraft rollover.

During the flight, the roll value is over 90°, which indicates the aircraft is rollover. Meanwhile, the flight controller gave Moto2 a power output of 100%, which indicates the power output also malfunctioned. Now, we need to evaluate which side the aircraft rolled over to.



As shown above, the flight controller gave Moto2 a power output of 100%, but the aircraft still rolled over to the Moto2 side (review section Pitch and Roll for a better understanding of the aircraft's rollover direction). This means the signal from the flight controller is right, but the Moto2 malfunctioned and led to aircraft rollover.

3 possible causes for this accident: 1. Propeller fall off from the motor (more likely); 2. Motor ESC malfunctioning (less likely); 3. Motor malfunctioning (extremely less likely).

Case Three: Compass is mounted REVERSELY

As shown above, part C shows the aircraft was heading south and flying to the right, the correct reading on the altitude gauge should be tilting to the right (shown in part B), but the actual reading is tilting to the left (shown in part A). There is only one possible cause for this circumstance – the compass is mounted reversely. The result of this would be the aircraft lost control and flying in a certain direction during the flight or RTH under GPS mode.

⚠ When the aircraft is out of control, switch to ATTI mode, then return the aircraft manually. DO NOT use auto return-to-home.

If FD1 has this issue, it's most likely that the GPS cover is mounted reversely.

If SD4 has this issue, there are two possible causes:

1. The compass is broken due to external impact. It happened to the older SD4 when there was a glue to secure the compass module.
2. The landing gear offsets due to screws falling off. (extremely less likely)

Case Four: Compass Malfunction

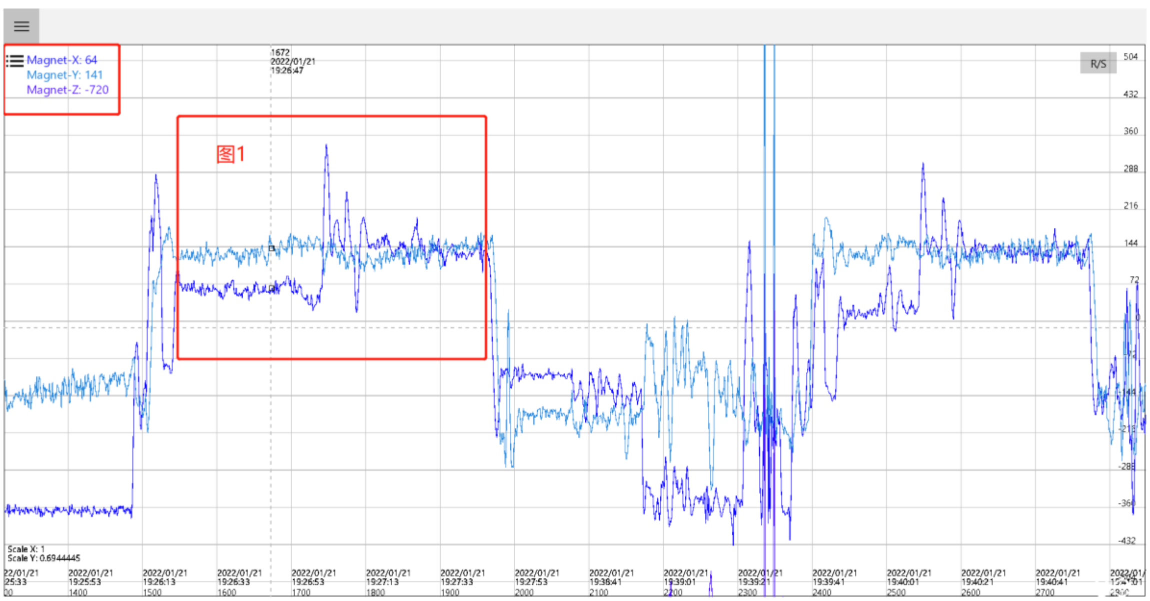


Figure 1

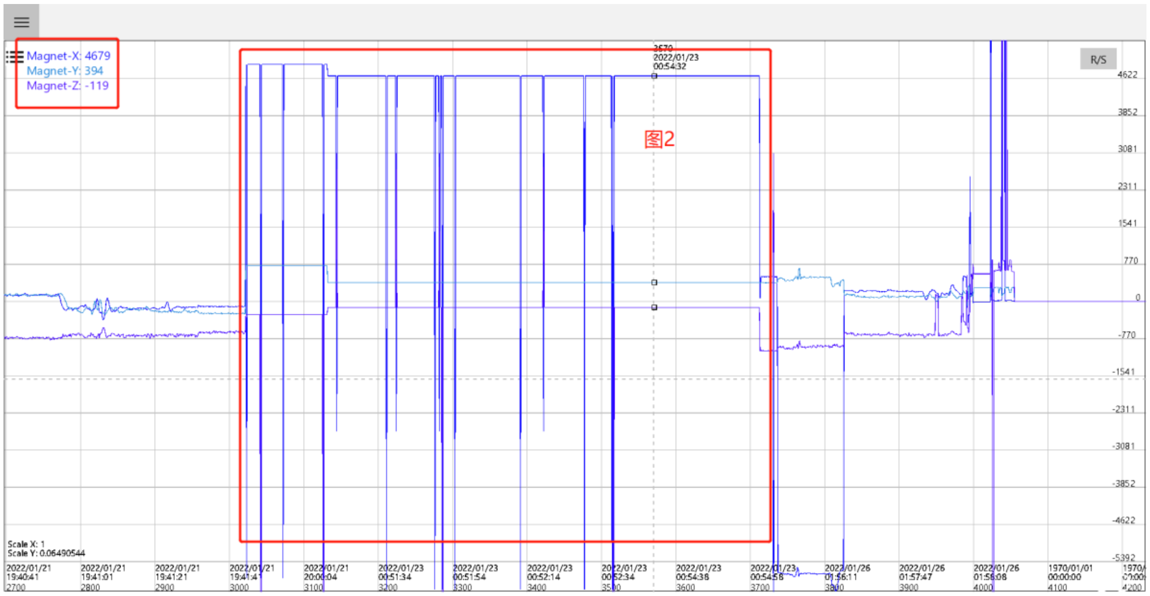


Figure 2

When the aircraft is unlocked and take-off, the normal compass value is not over 800, as shown in figure 1, because a full circle for compass is 800 with ±400.

The data shown in figure 2 shows abnormal compass data reading, as the maximum compass value is past 800, and the data is still (shown as a flat line). This abnormality would cause the aircraft to lost control and crash under GPS or RTH mode.

⚠ When the aircraft is out of control, switch to ATTI mode, then return the aircraft manually. DO NOT use auto return-to-home.

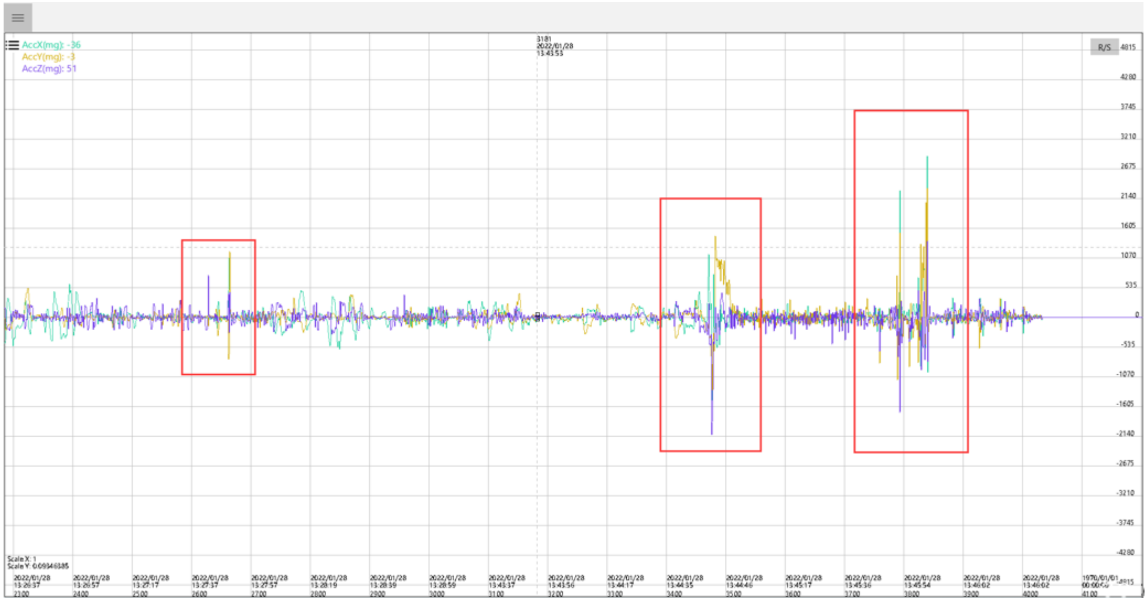
If SD4 has this issue, there are two possible causes:

1. The compass cable has a bad connection with the motherboard.
2. The compass module itself is broken.

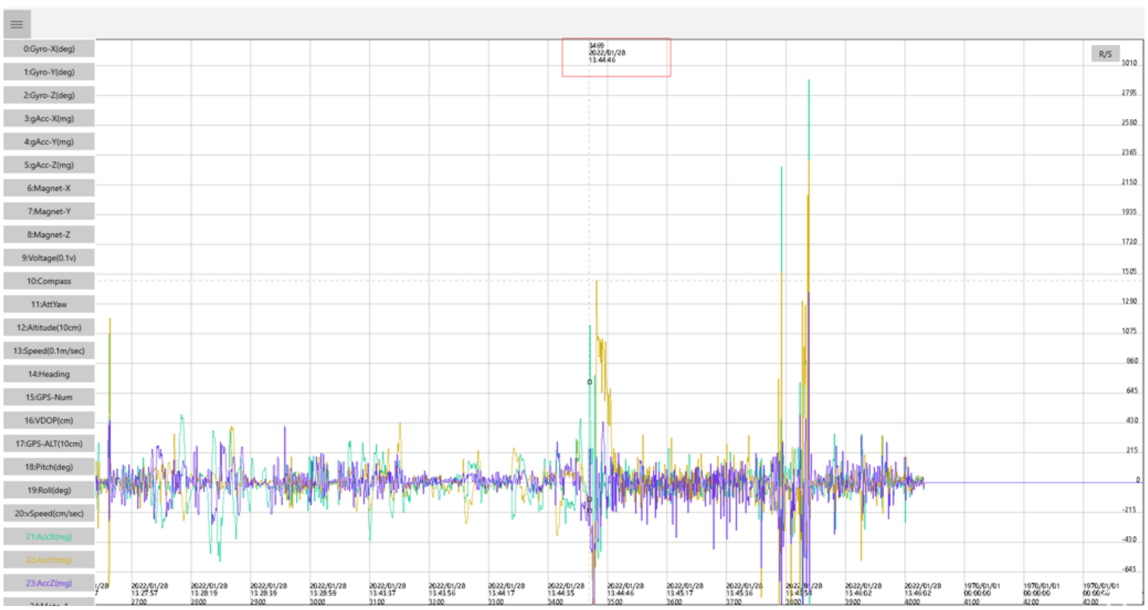
If FD1 has this issue, there are four possible causes:

1. The GPS connector is damaged or loosened due to constant pulling of the GPS cable when installing/removing the GPS cover.
2. GPS cover is damaged, or GPS connected is loosened due to the aircraft crashing, or heavy shaking.
3. The barometric membrane is damaged. The water ingress damages the GPS module. (FD1 GPS module is next to the barometer and compass)
4. When removing/installing the battery, water comes into the aircraft chamber to the motherboard, and causes damage.

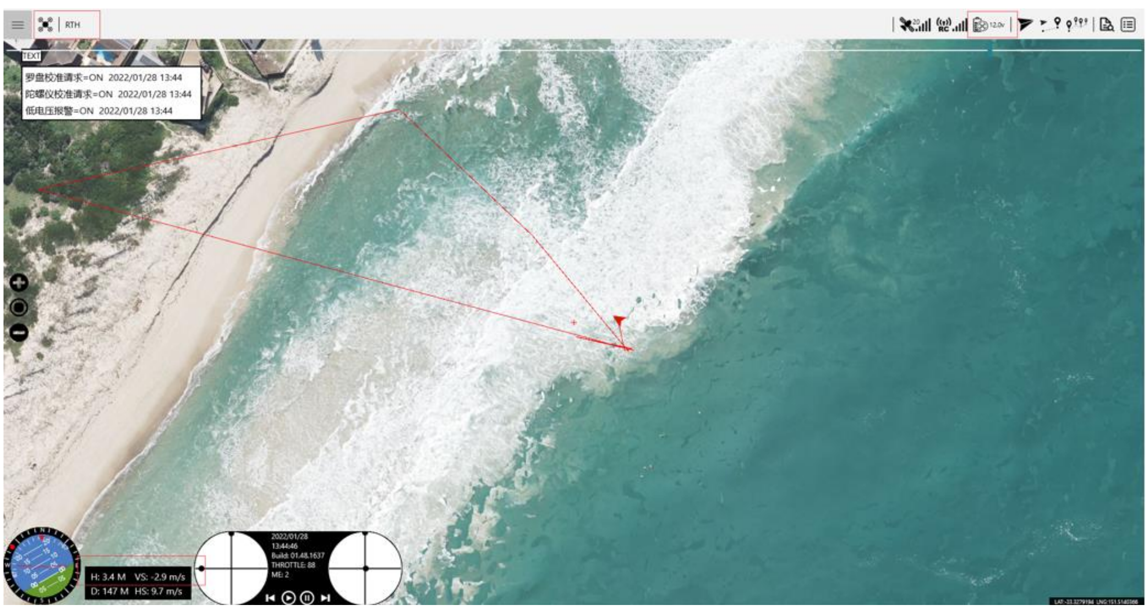
Case 5: Aircraft Crashing

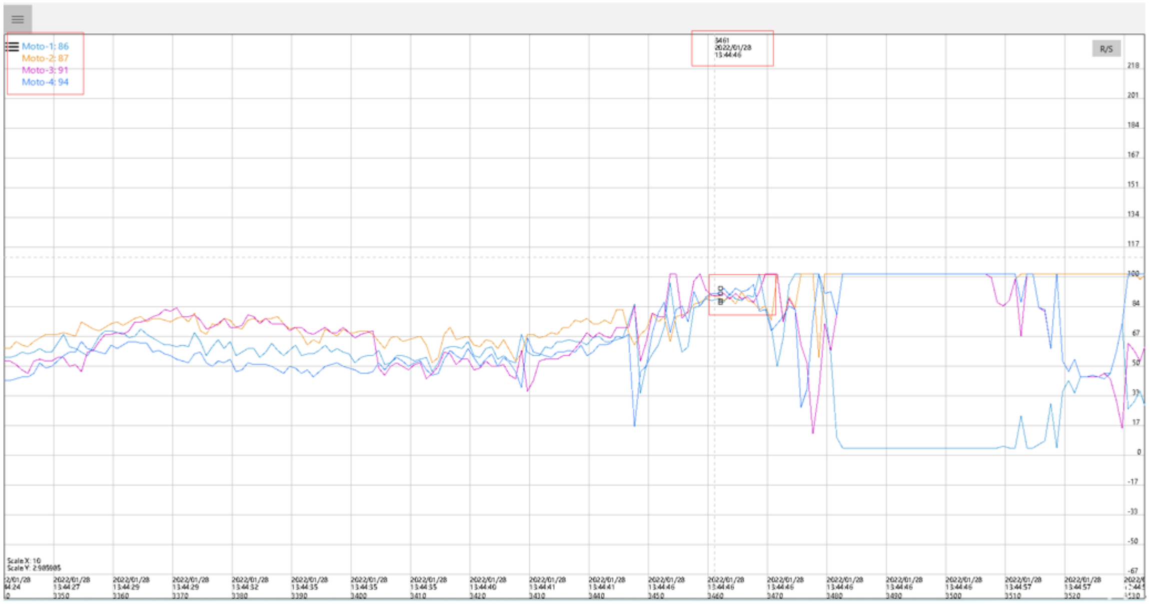


1. Import Logs

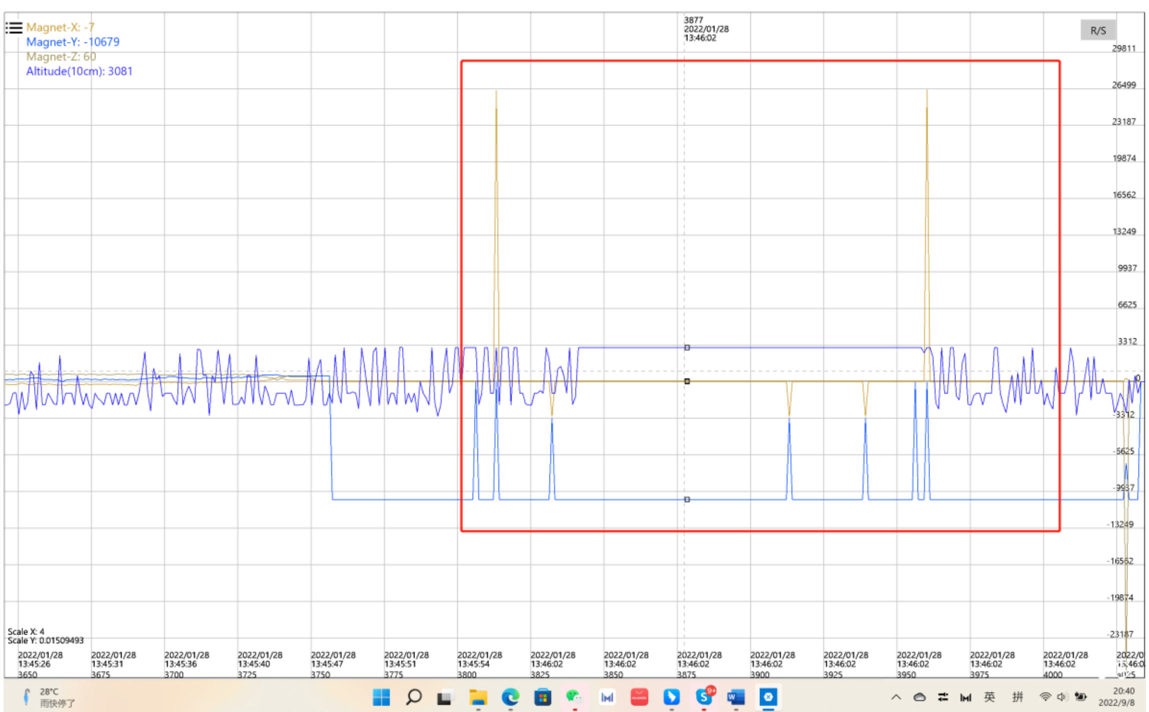


2. As shown on the Acc dataset, there was an abnormal reading on 2022/01/28/13:44:46 (marked with red boxes). On the map view, we can see that this abnormality happened when the aircraft was initiated return-to-home, and the flight battery reached 12.0V and started landing on the water.





3. During aircraft auto landing (shown above), the pilot tried to ascend the aircraft when seeing the aircraft descending. According to the data shown above, the throttle value was 88. It exceeded the normal throttle value, which means the motor power was insufficient. Meanwhile, the pilot was trying to give more throttle to the aircraft, but the aircraft kept descending. The throttle was over 90 during the time around 2022/01/28/13:44:46. Therefore, we can conclude that the aircraft crashed into the water due to insufficient motor power caused by low battery.
4. After a while, the aircraft was flushed to the coastline. Water came into the aircraft and damaged the internal. (Showing below)



Conclusion:

1. There was an error when the pilot was landing the aircraft. The pilot landed the aircraft on uneven ground and caused the aircraft to roll over. The motor was still spinning after the rollover. (The pilot should've locked the aircraft) It damaged the GPS cover and the strobe light water ingress protection.

2. The pilot wasn't aware of the aircraft's low battery voltage when flying the aircraft the second time. The aircraft reaches level 2 low battery warning and initial auto landing, causing the aircraft to crash into the water. Then the aircraft was flushed to the coastline. According to the barometer data, water came into the aircraft and damaged the barometer.

Version Information

SwellPro products are constantly improving, so as the product user manuals. It is recommended to visit support.swellpro.com to check and download the latest user manual.

Version

1.0 Flight Logs Tool User Guide 1.0 Edition

1.1 Flight Logs Tool User Guide 1.1 Edition

