M400 Airborne Hyperspectral Cameras-Guide to Data Acquisition

Revision Record:

Version number	Revision Date	Reviser	Revised content overview
1.0	2025/12/31	Zheng Jiajia	Initial version

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1. Summary

The purpose of this guide is to provide users with a comprehensive and detailed airborne hyperspectral camera flight operation guide to help users efficiently and safely complete the task of collecting hyperspectral data. As an advanced remote sensing equipment, the airborne hyperspectral camera can capture the spectral information reflected by objects, and provide accurate data support for agricultural monitoring, environmental protection, geological exploration and other fields.

2. Adapted model

The User Flight Guide adapts to the following hyperspectral cameras: FS60-C, FS62-C, FS-50/30, FS-50/60, FS-50/90, FS-50/120, FS-50/150 and FS-50/180.

3. Flight Environment Requirements

3.1 Flight Environment Requirements

1. Do not fly in bad weather, such as strong wind (the maximum wind speed supported by the UAV is greater than 15 m/s. In order to ensure that the camera has no distortion during the acquisition process, please fly in an environment with a wind speed less than 4 m/s. When flying in the rain, it is important to follow the requirements stated in the IP45 rating instructions.
2. Choose a place with open space, no tall buildings around and no large drop in terrain as the flight site. A large number of buildings using steel bars will affect the work of the compass, and will block the GNSS signal, resulting in poor positioning effect of the aircraft or even unable to locate.
3. When flying, please keep in line of sight control, away from obstacles, people, water, etc.

4. Do not fly in areas with high-voltage lines, communication base stations or transmission towers to avoid interference with the remote control.
5. In high altitude areas, the performance of the aircraft battery and power system will decrease due to environmental factors, and the flight performance will be affected. Please fly with caution.

3.2 Preflight check

1. The batteries of the remote control and the aircraft are fully charged.
2. The arm is deployed and the arm sleeve, landing gear and battery are all locked to the indicated position.
3. The motor and blade shall be fixed reliably without looseness; The motor shall not be jammed and the blade shall not be damaged.
4. All device firmware is the latest version of the official website.
5. Ensure that the runaway behavior setting meets the requirements of the pilot, it is strongly recommended to set to return.
6. Set the appropriate return altitude according to the flight environment to ensure the safety of return.
7. Make sure the controls are in accordance with the flying habits.
8. Check whether the obstacle avoidance is open and whether the obstacle avoidance distance is set reasonably.
9. If multiple aircraft operate at the same time, please divide the airspace to avoid mid-air collision.

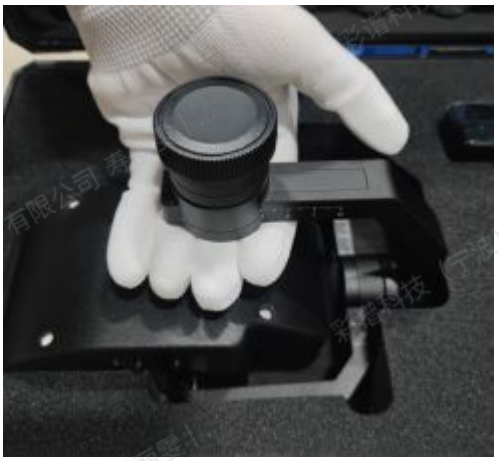
3.3 Landing Precautions

1. The FS-64L has a large volume, which blocks the downward obstacle avoidance sensors of the UAV. Manual landing is therefore required.

4. Installing a hyperspectral camera

4.1 Mount the camera to the drone

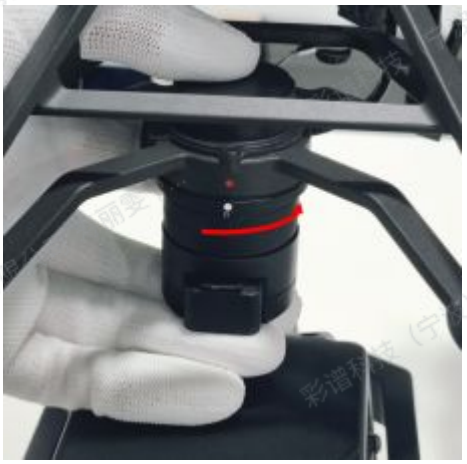
1. Grab the top of the gimbal, hold the top of the gimbal, and take out the camera, as shown in the figure.

2. Remove the protective lens cover.



3. Rotate the gimbal protective cover counterclockwise and remove it, turn the white dot towards yourself, buckle it to the drone gimbal bracket, and rotate the gimbal to align the red dot of the gimbal bracket with the red dot of the UAV gimbal bracket.

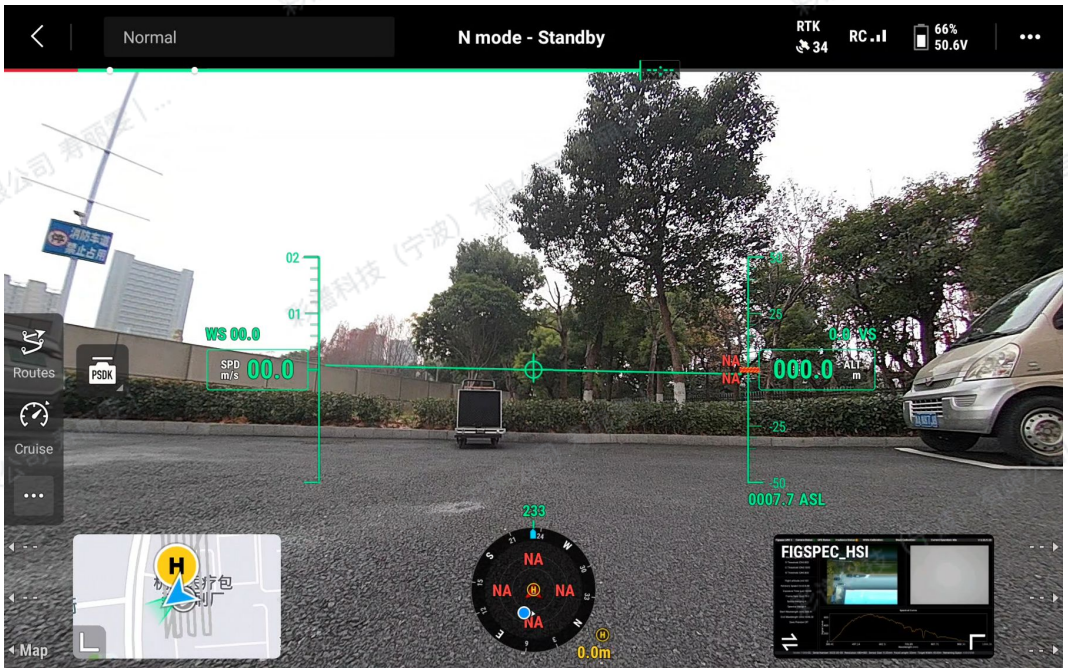



4.2 Turn the hyperspectral camera on or off

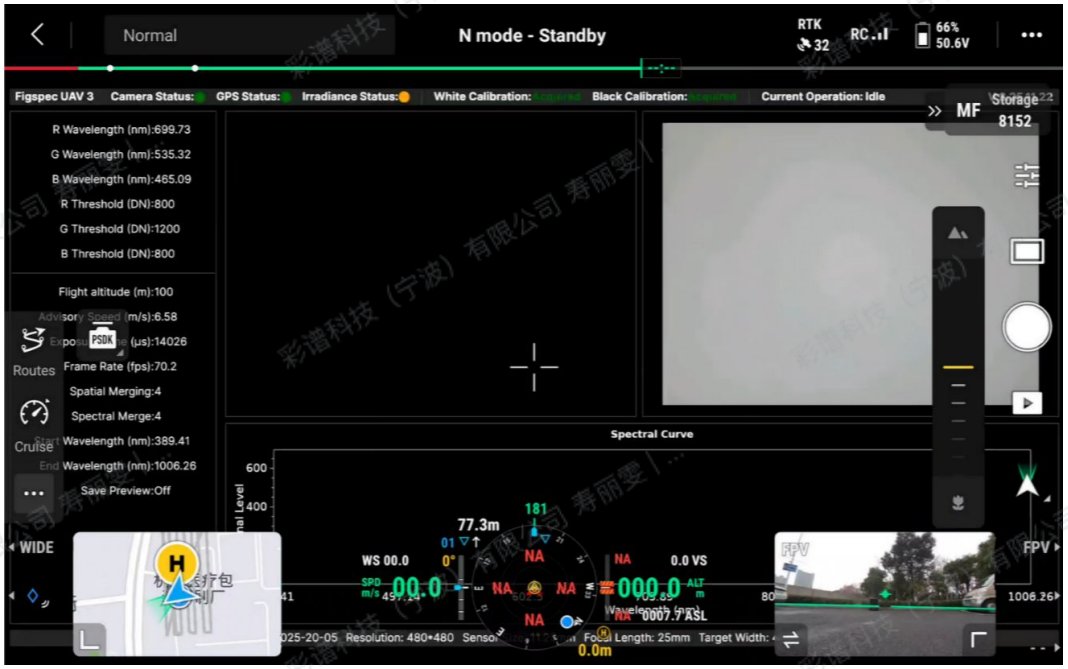
Camera on

1. Turn on the drone remote controller and the drone.

2. 2. Wait for the camera to complete its self-rotation and return to the center position.
3. 3. Then wait for the camera to power on. Once the camera is on, a small window named 'FIGSPEC_HSI' will appear in the lower right corner of the remote controller.



4. When the camera is turned on, the software will automatically start. Once the software is running, the camera status in the top status bar will show green, indicating that the camera is connected.



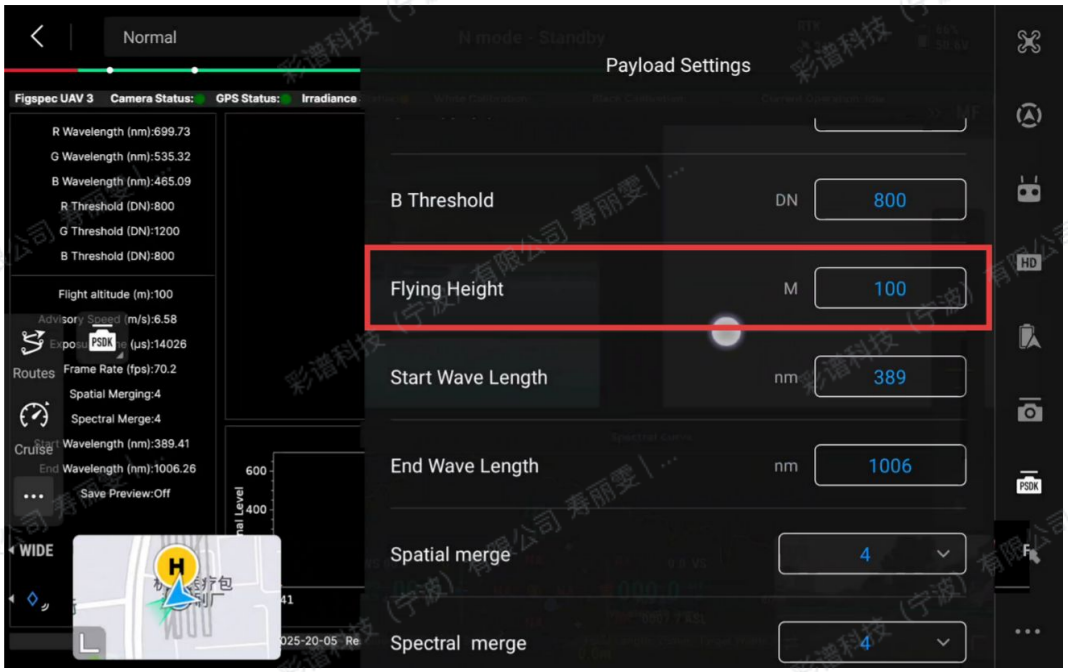
Camera shutdown

1. Turn off the UAV.
2. Turn off tthe remote control.
3. Take the camera down.

5. Camera parameter settings

5.1 Set Flight Altitude

- The flying altitude of the drone, in meters (m).
- The flying height is set according to the actual needs of the individual, and the recommend flying height is 50-150 meters.
- Flight altitude affects both flight speed and target resolution (I. E., the actual size of space for a single pixel).
- The flight altitude of the drone in the route mission needs to be consistent with the parameters of the PSDK.

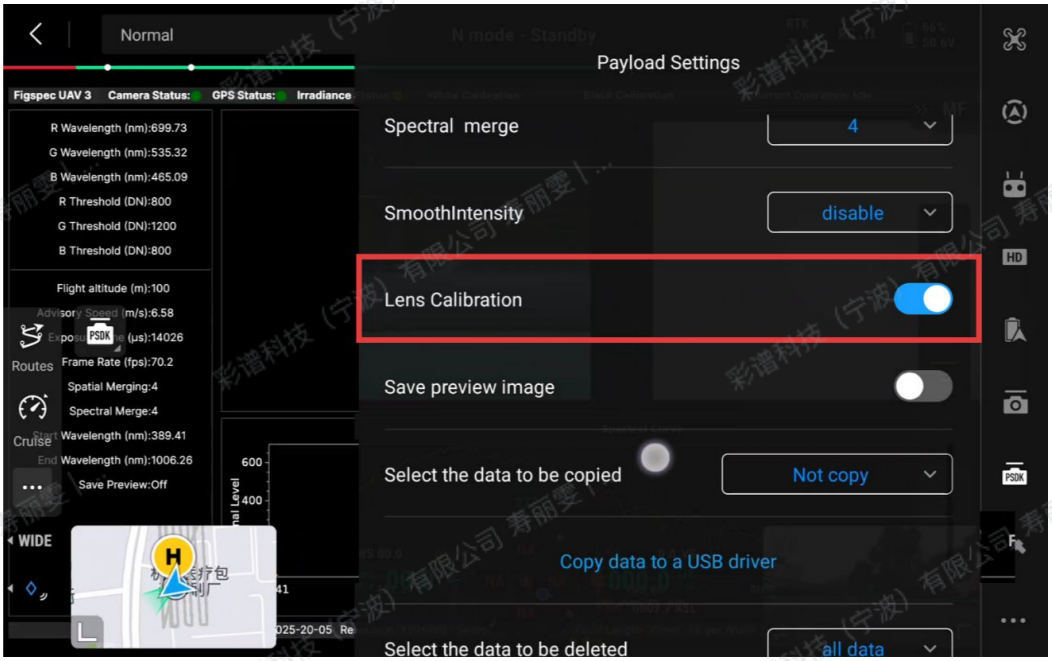




5.2 Enable Lens Calibration

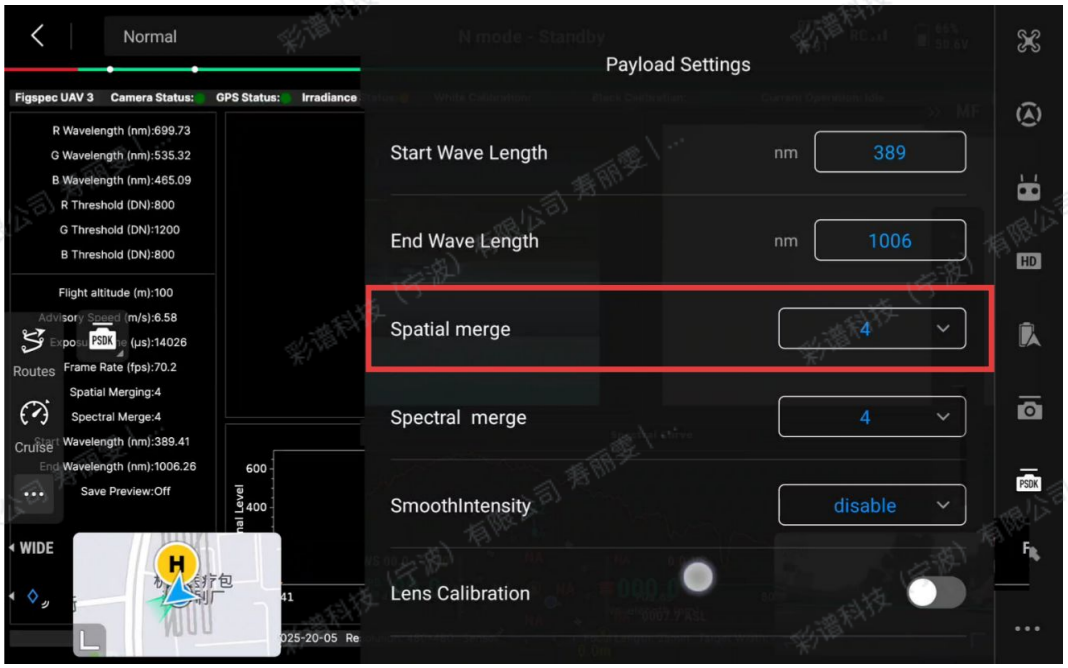
Enable lens calibration in PSDK:

Lens calibration coefficient is the correction of the effect of the camera itself on lighting.



5.3 Set up spatial merge (set as needed)

Set spatial merge in PSDK.

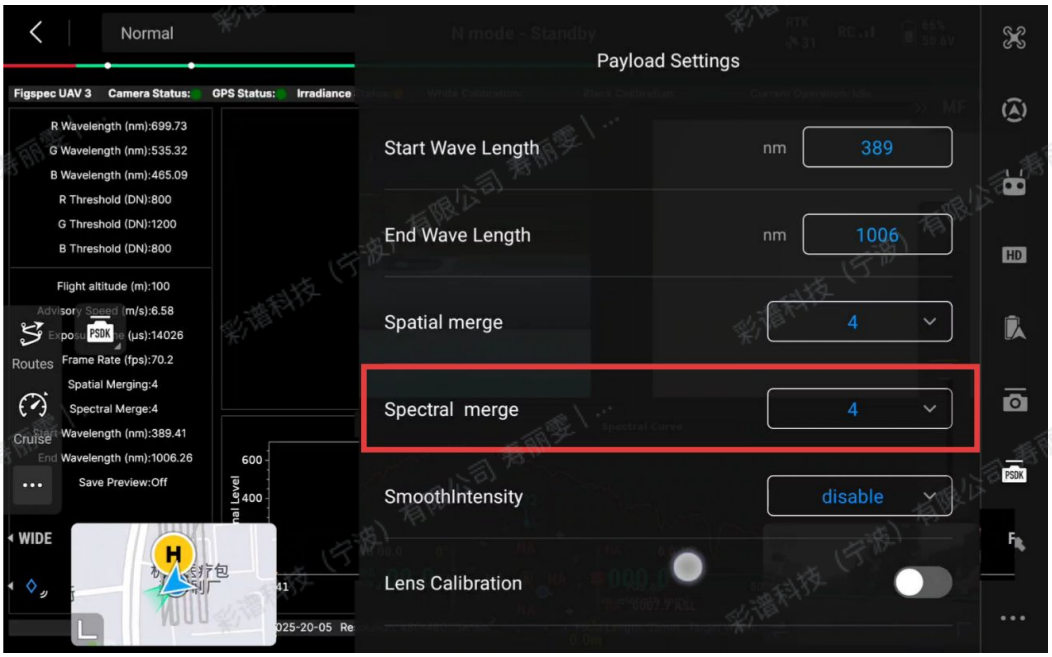


The spatial merge supported by different cameras are as follows. Tip: FS-62C only supports simultaneous spatial and spectral merge settings.

	Merge mode	1 Consolidation	2 C
FS-62C	Average	1280px	
FS-60C	Sum	1920px	
FS-50/30	Sum	1920px	
FS-50/60	Sum	1920px	
FS-50/90	Sum	1920px	
FS-50/120	Sum	1920px	
FS-50/150	Sum	1920px	
FS-50/180	Sum	1920px	

5.4 Set Spectral Merge (set as needed)

Set up spectral merging in PSDK:



The spectral combinations supported by different cameras are as follows. Tip: FS-62C only supports simultaneous spatial and spectral merge settings.

	Merge mode	1 Consolidation	2 Cor
FS-62C	Average	1024	
FS-60C	Sum	1200	
FS-50/30	/	/	
FS-50/60	/	/	
FS-50/90	/	/	
FS-50/120	/	/	
FS-50/150	/	/	
FS-50/180	/	/	

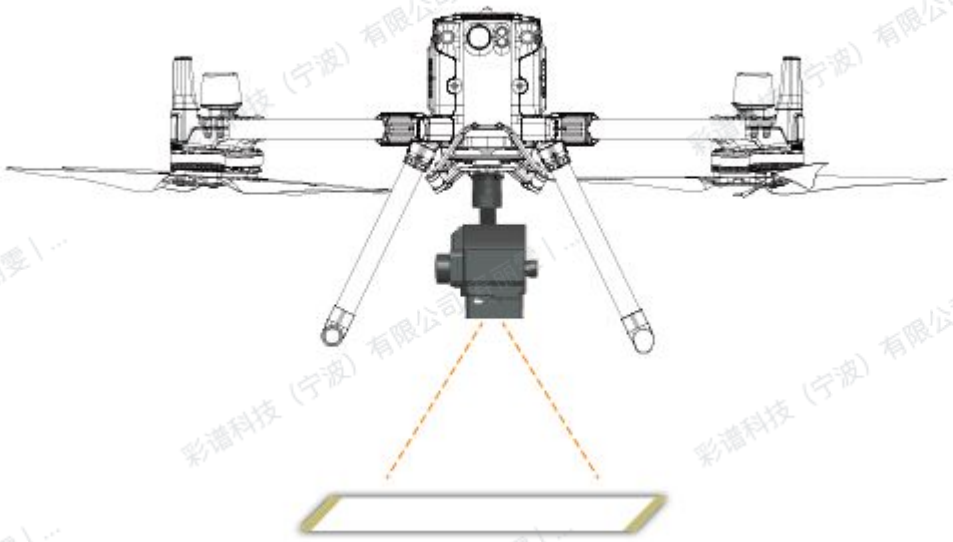
5.5 Set exposure time

The basic principle of setting the exposure time is to **avoid overexposure and underexposure**: setting the exposure time too long will lead to overexposure of the image, too high brightness and loss of details. While setting too short will lead to underexposure of the image, insufficient brightness and increased signal-to-noise ratio. Therefore, it is necessary to find a suitable exposure time, so that the image is

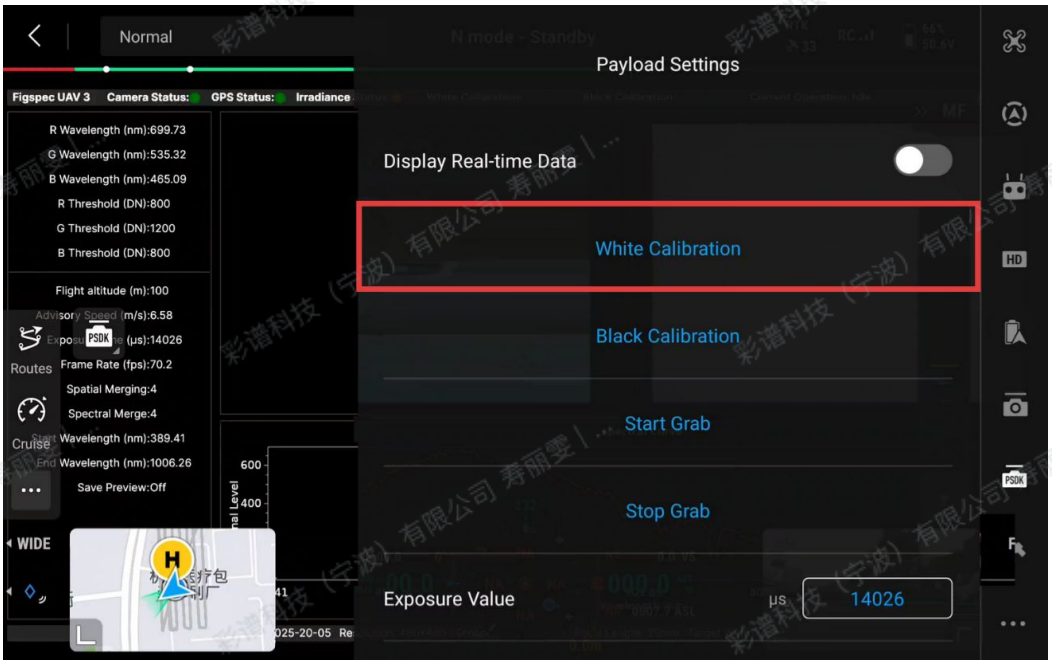
neither exposed nor dark.In the case **where neither the reflectivity plate nor the sample is overexposed**: the higher the signal, the better. The software provides two options for setting exposure.

Automatic exposure setting method:

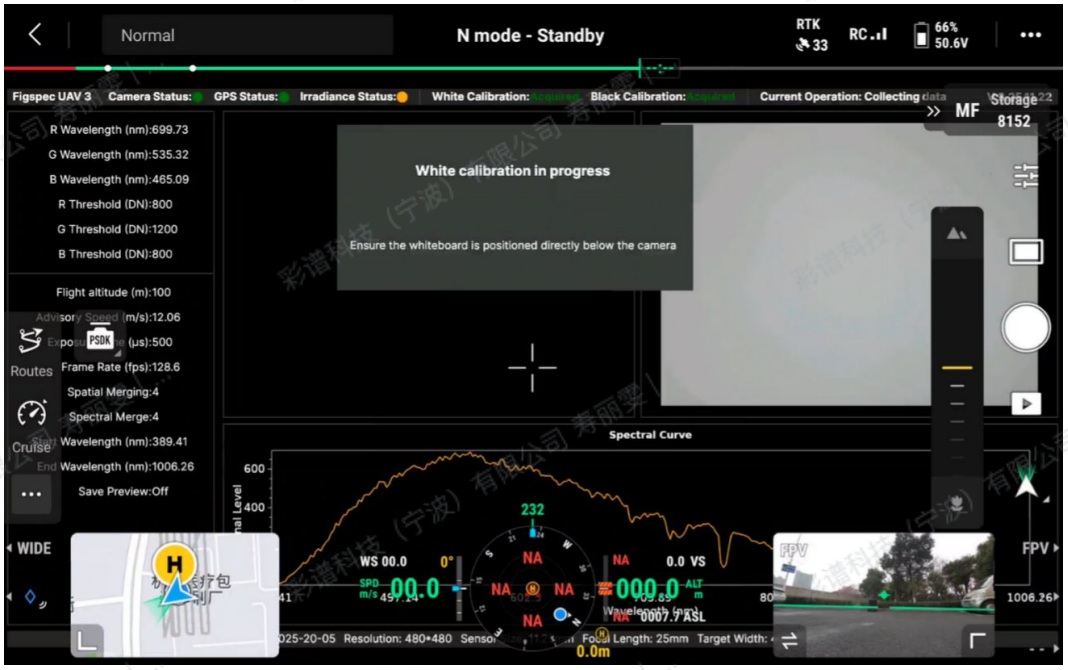
1) Place the 'Reflectivity Calibration Cloth' under the camera without shadows directly under the camera.



2) Click 'White Calibration' in PSDK, and the camera will automatically calculate the appropriate exposure time and set it.

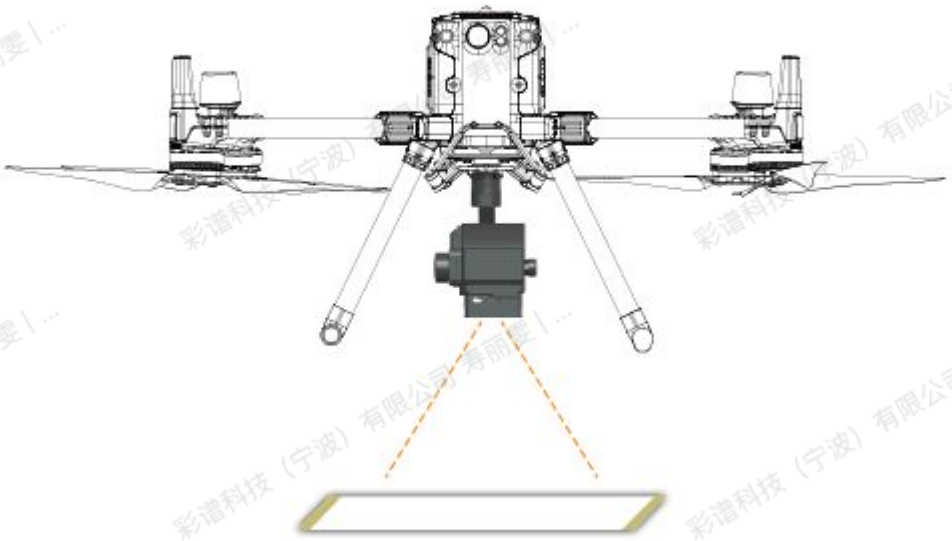


3) The software sets the exposure time to between 70%-80% of the signal during acquisition of the reflectance plate,the white calibration status is updated to 'Acquired' and a white calibration file is generated for subsequent correction use.

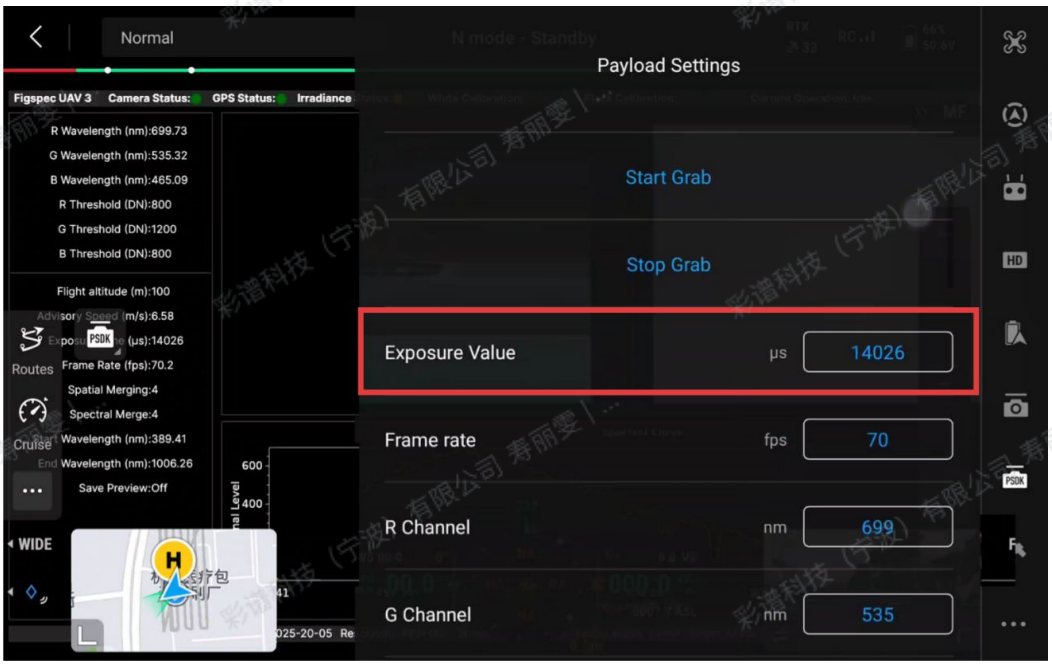


Manual exposure value adjustment mode

1. Place the 'Reflectivity Calibration Cloth' under the camera without shadows directly under the camera.



2. Click 'Start Grab' and check the maximum signal of the spectral curve at the bottom of the software.
3. 'Stop Grab', adjust the exposure value in psdk and then start grab.

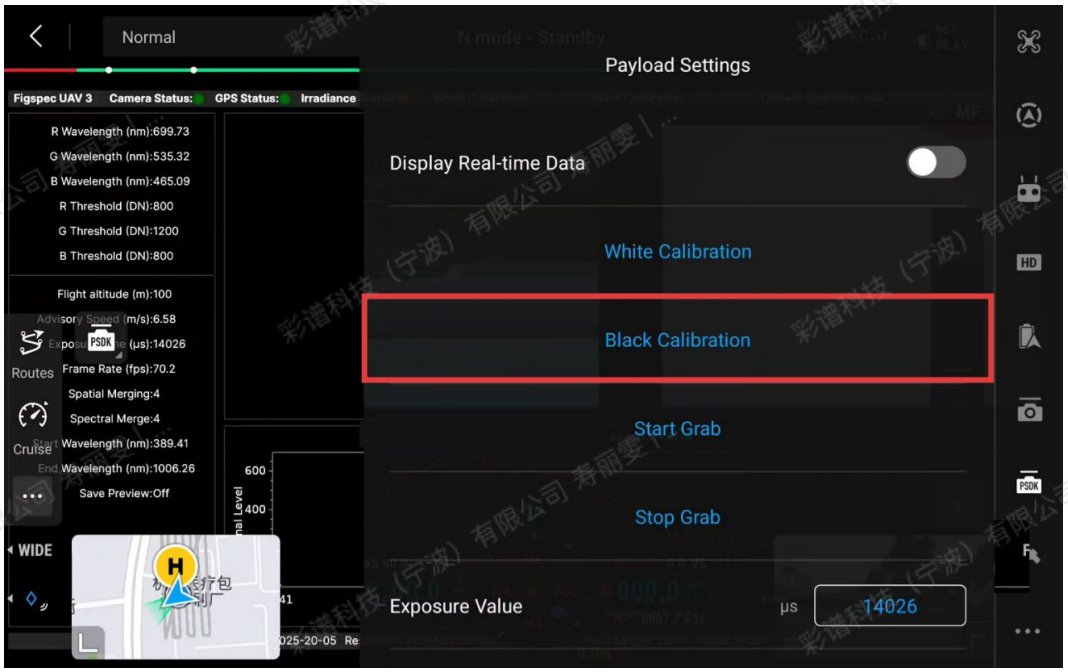


4. Repeated operation to maximize the amount of signal and observe the changes in image brightness and details to find the most suitable exposure time.Generally adjusted to a maximum reflectance signal of around 3000.

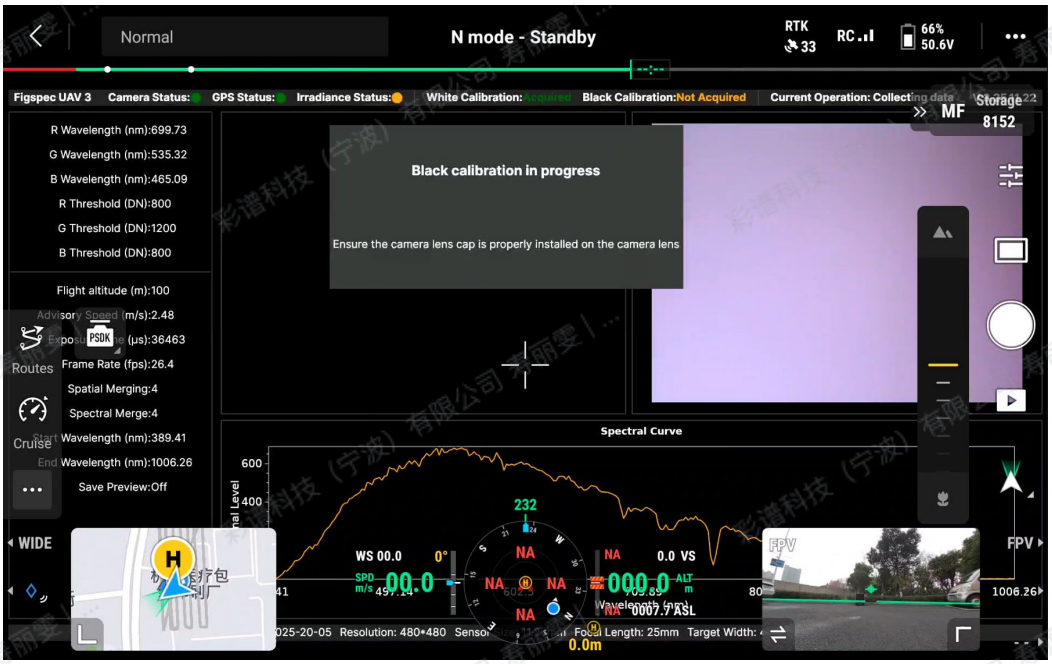
5.6 Black calibration

Black calibration is also called 'deducting dark current', and the camera dark current signal will be deducted from the spectral data collected after black calibration.

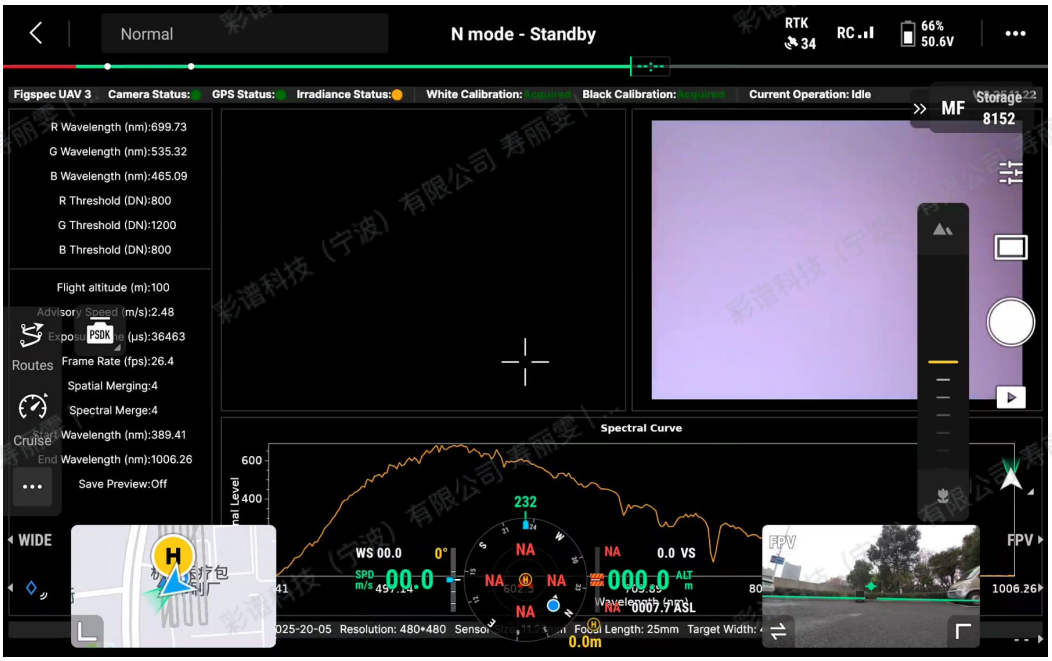
1. Click “Black Calibration” in the PSDK '.



2. The software interface shows 'Black calibration in progress'.

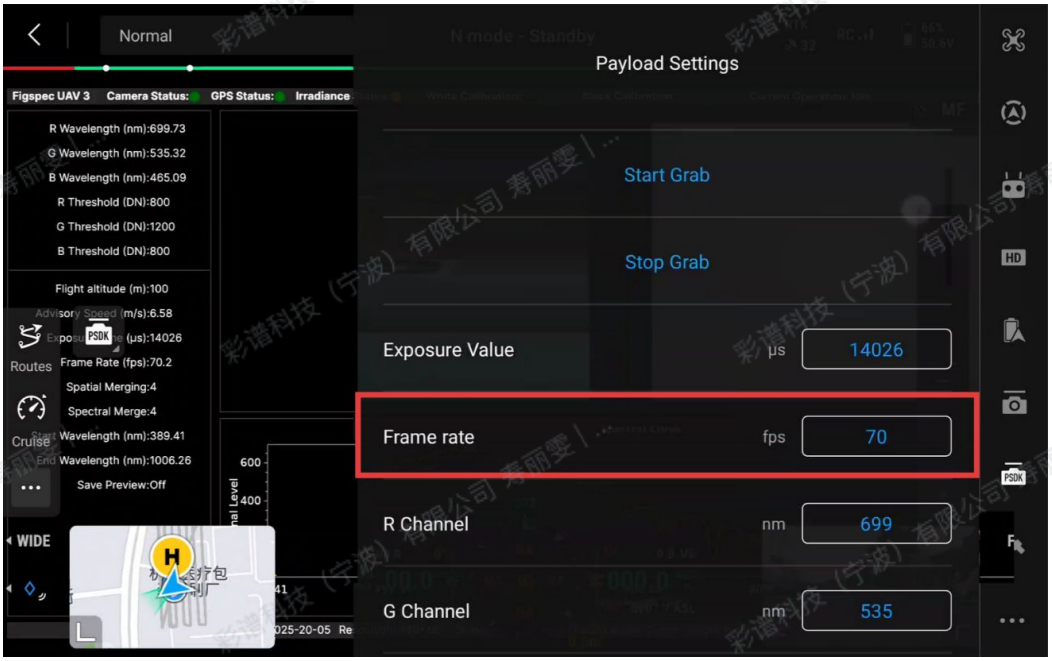


3. After the black calibration is completed. After successful calibration, the black calibration status is updated to 'Acquired'.



5.7 Set Frame Rate

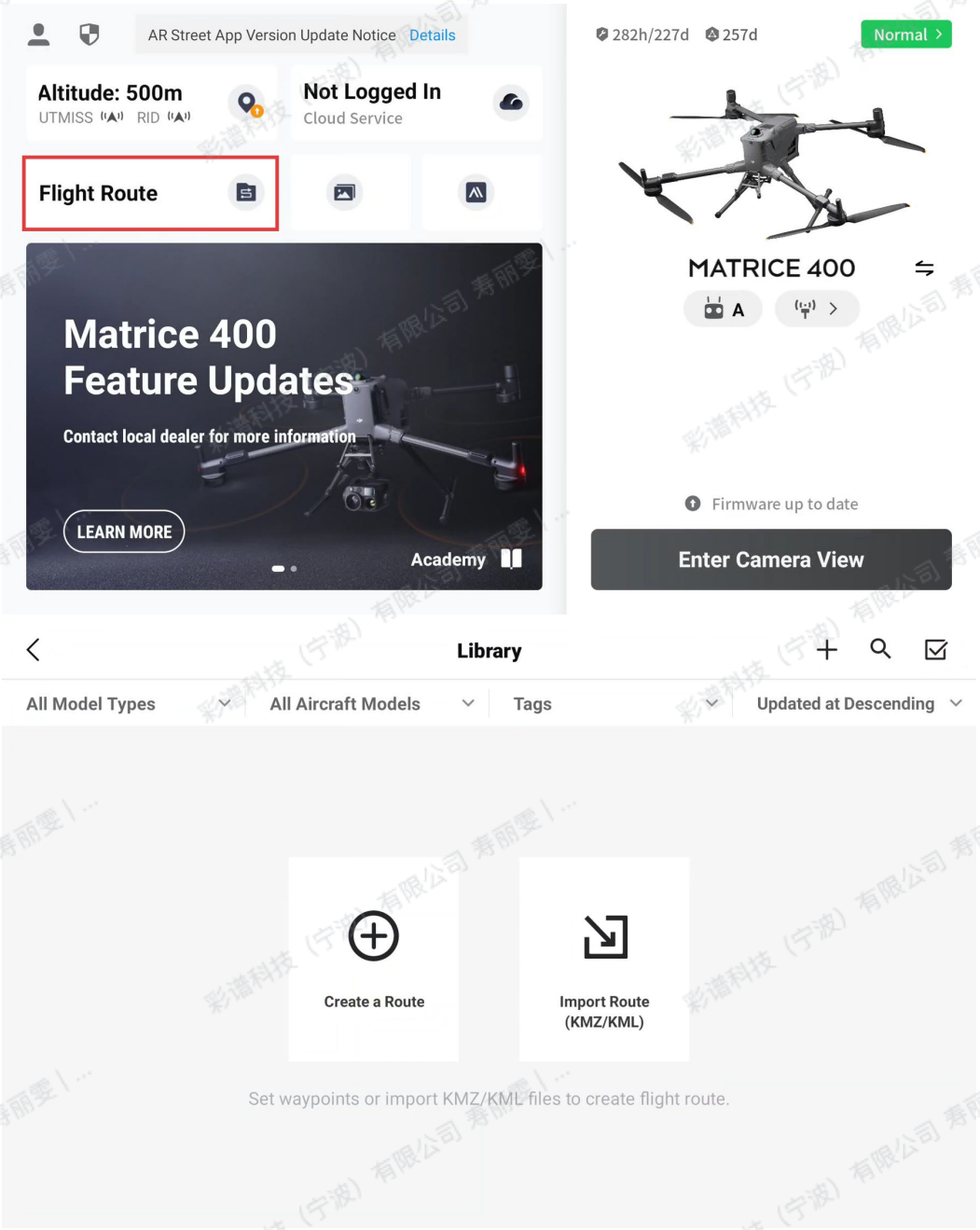
The frame rate range is 1-128fps. In order to avoid the drone flying too fast, it is recommended to set the frame rate to between 50-100.

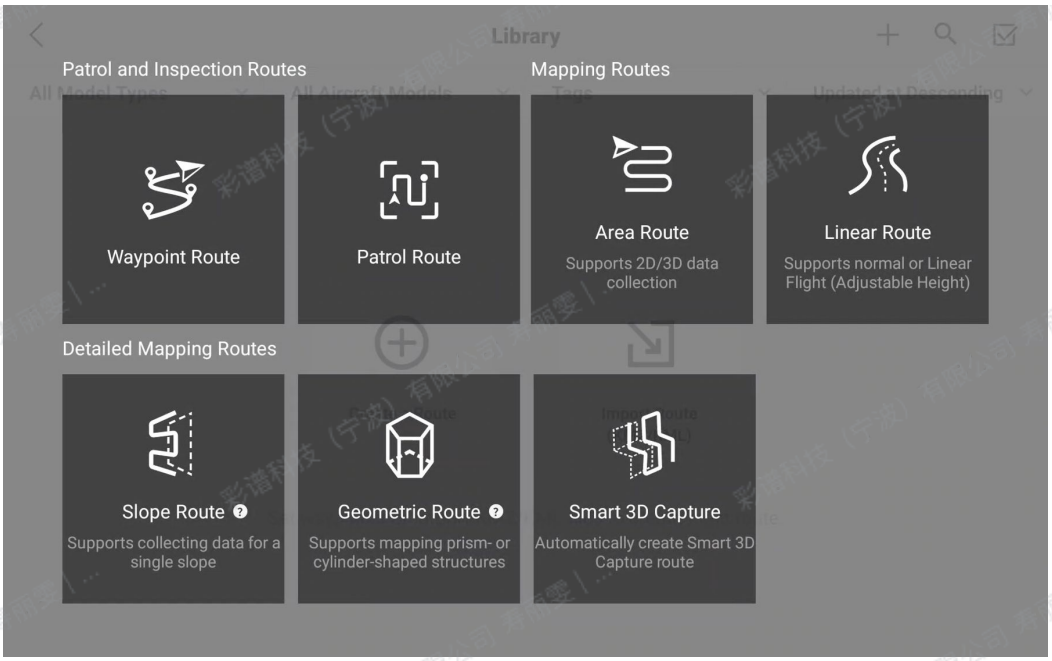


6. Route planning

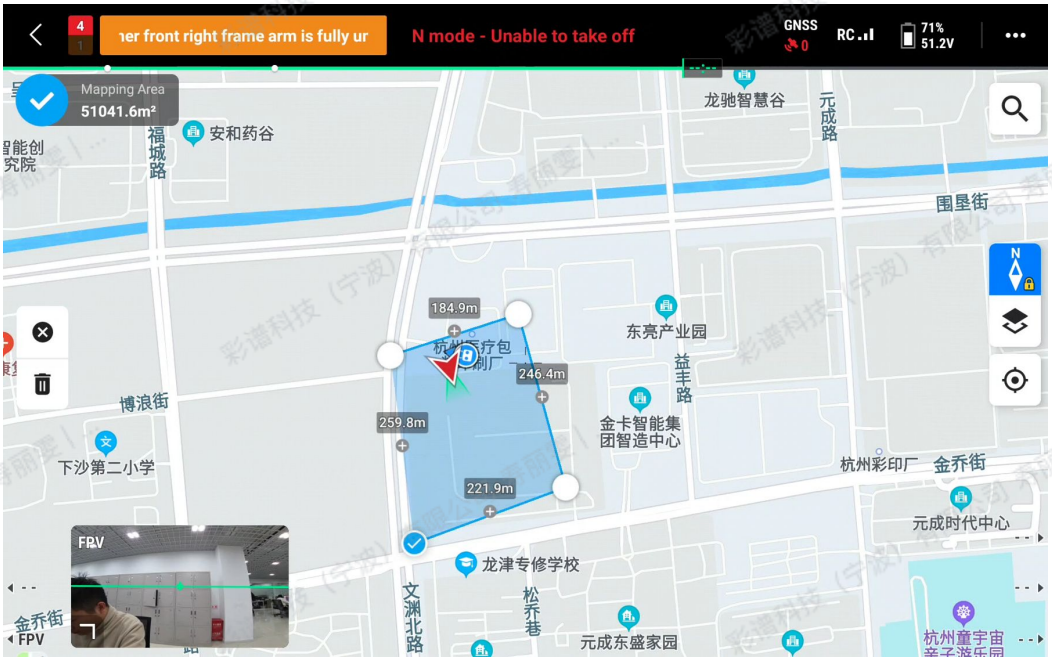
6.1 Planned route

1) Click 'Flight Route' on the DJI Pilot 2 homepage to enter the flight route library → 'Create a Route' → 'Area Route'.

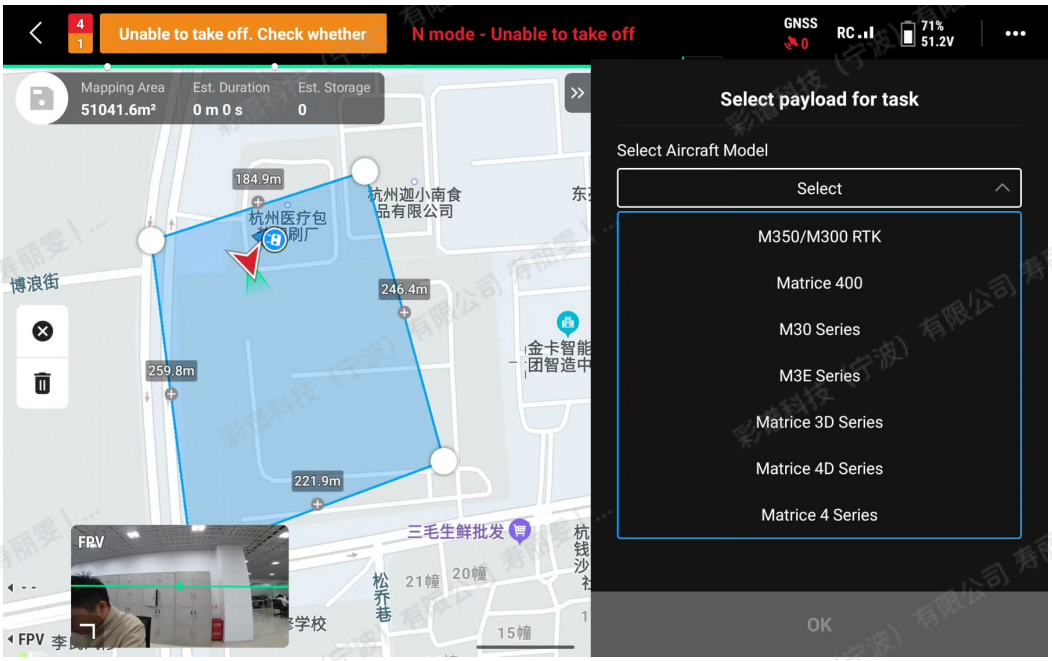




2) Click four points in turn in the map to draw a rectangular area, and then click '√' in the upper left corner .

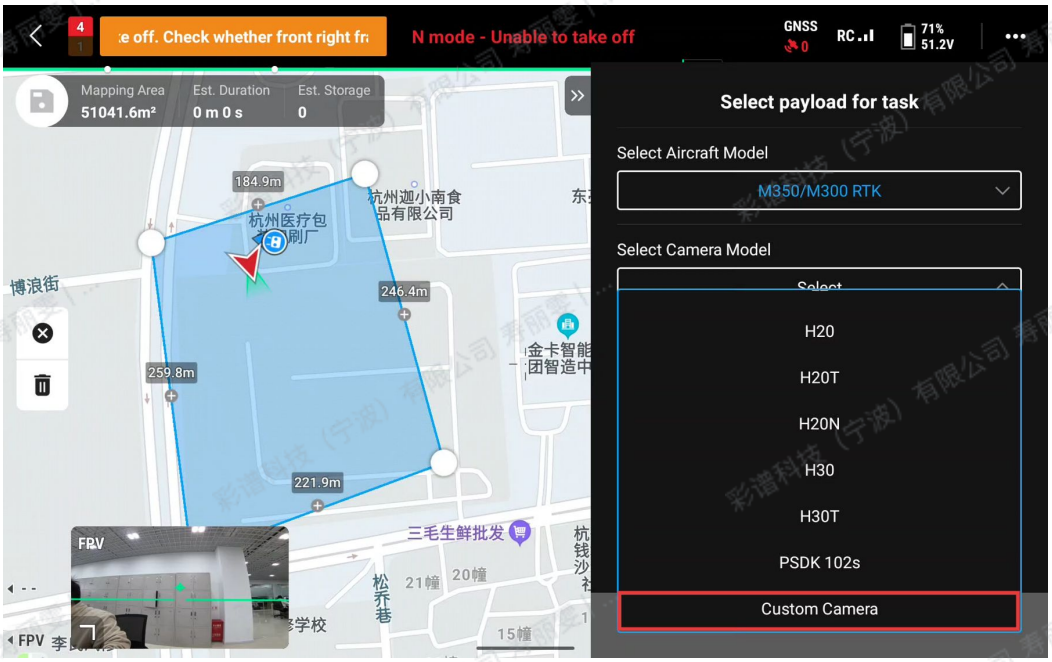


3) Select aircraft model as 'M350/M300 RTK'.

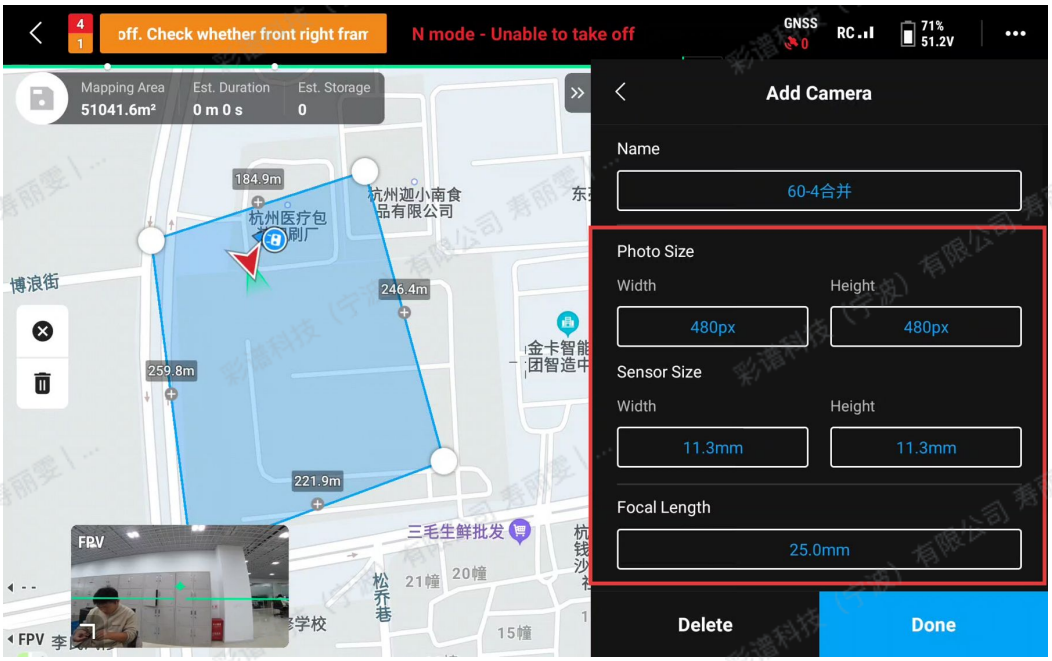


6.2 Select or add an onboard hyperspectral camera

1) Select a camera and select custom camera to add a hyperspectral camera.



2) Create a new camera according to the illustration.



a. Name: name according to camera type and resolution.

b. Photo size: the resolution is filled in according to the parameters calculated under the camera software.

c. Sensor size: The sensor size of the FS60-C and FS-50 series sensors are fixed at 11.3mm * 11.3mm.

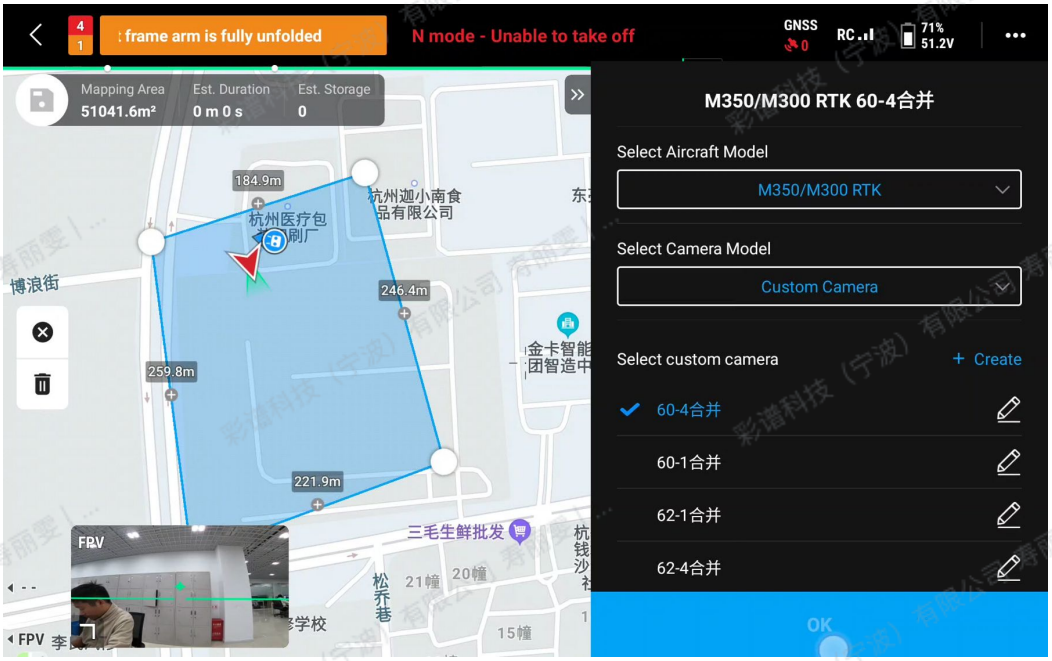
The sensor size of the FS62-C and FS64-C sensors is fixed at 6.4mm * 6.4mm.

d. Focal Length:

i. FS60-C and FS62-C:25mm.

ii. FS64-C:16mm.

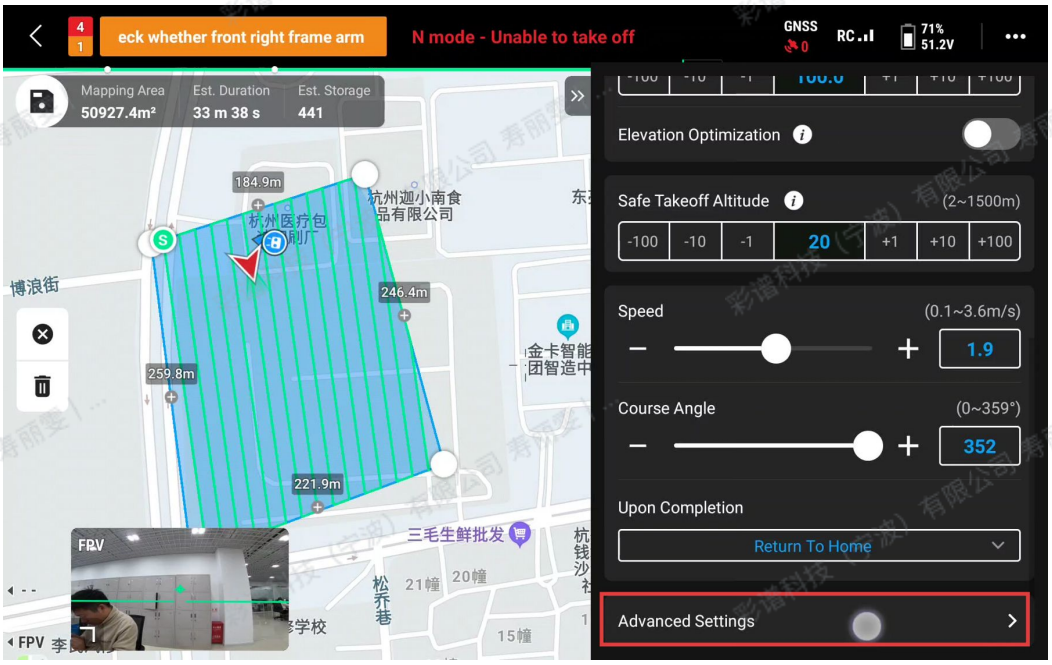
e. After setup, click 'Done' to save the camera.

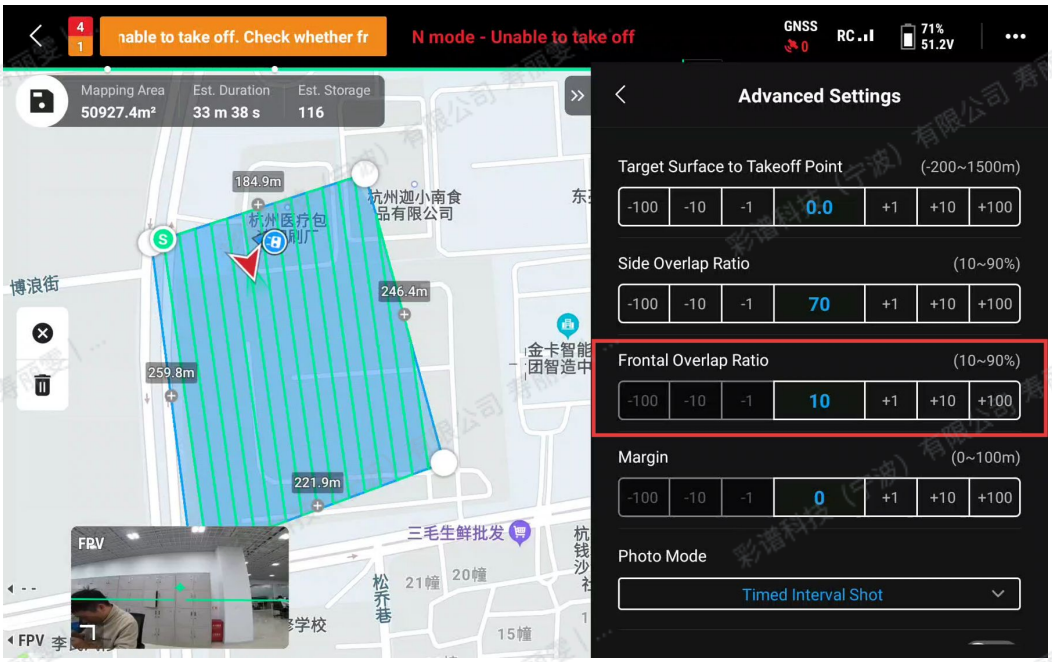


3) After saving, select the added camera, and then click 'OK' to proceed to the next step.

6.3 Set the heading overlap rate to 10%

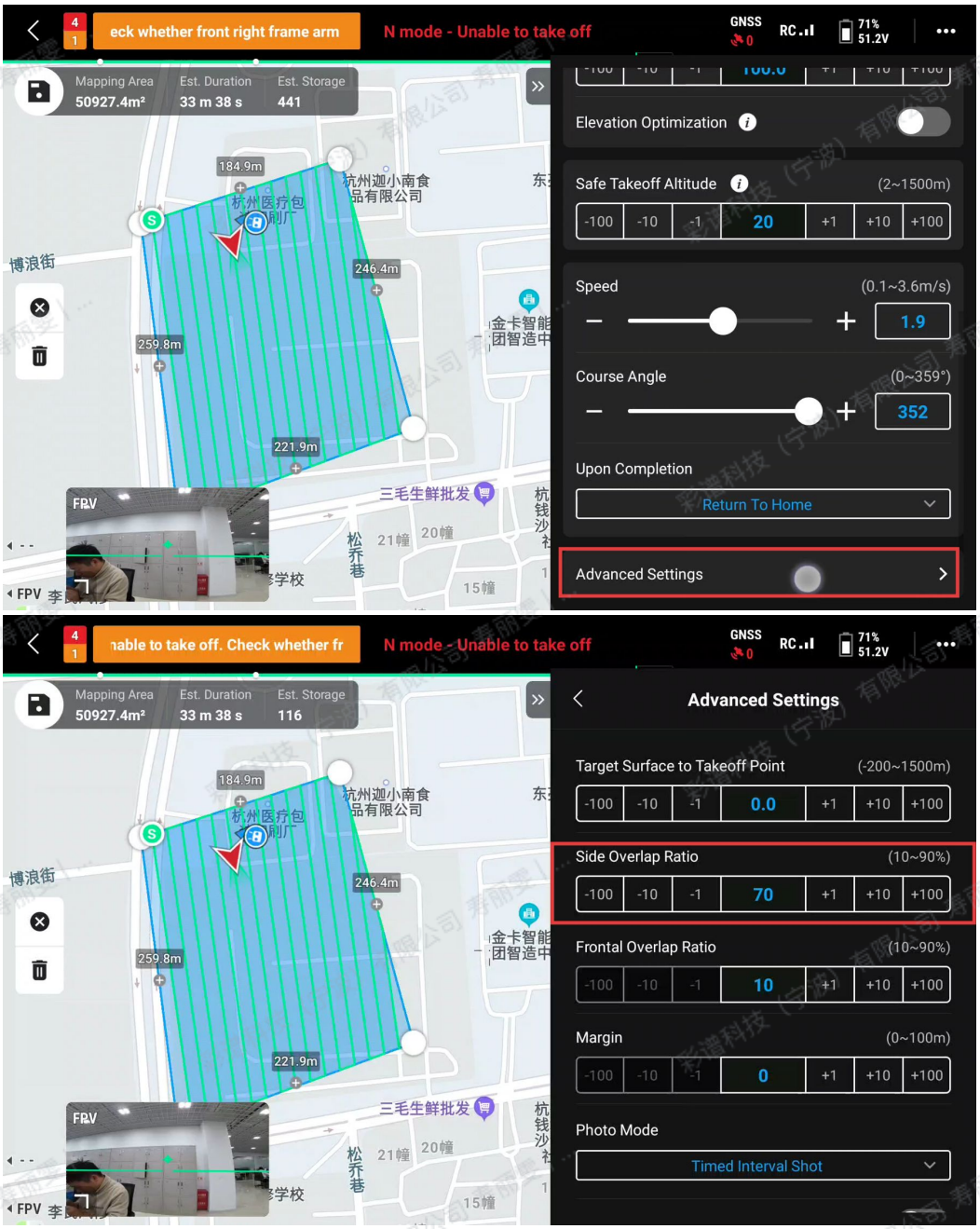
At the bottom of the route setting interface, enter 'Advanced Settings' and set 'Frontal Overlap Rate' to 10%.





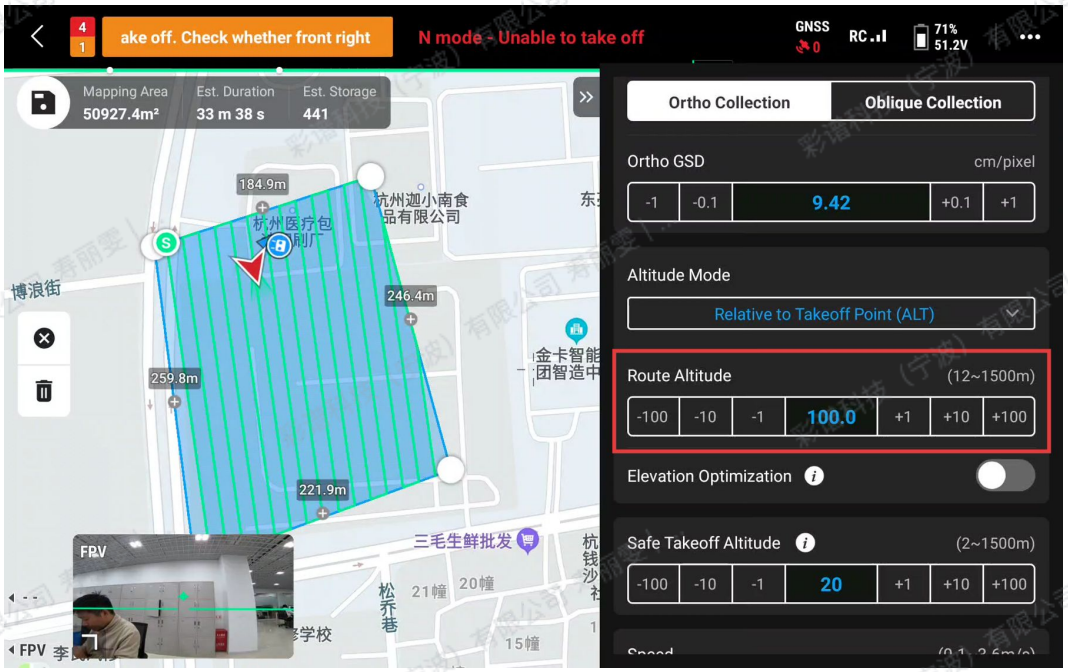
6.4 Set the side overlap rate over 70%

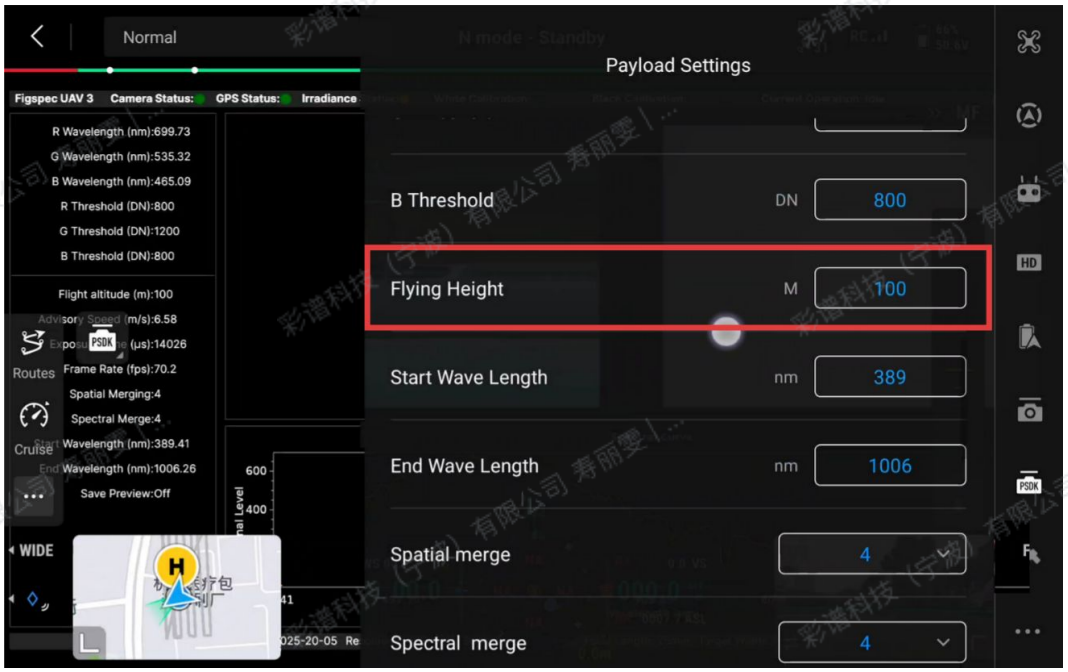
At the bottom of the route setting interface, enter 'Advanced Settings' and set the 'Side Overlap Rate' over 70%.



6.5 Set Route Altitude

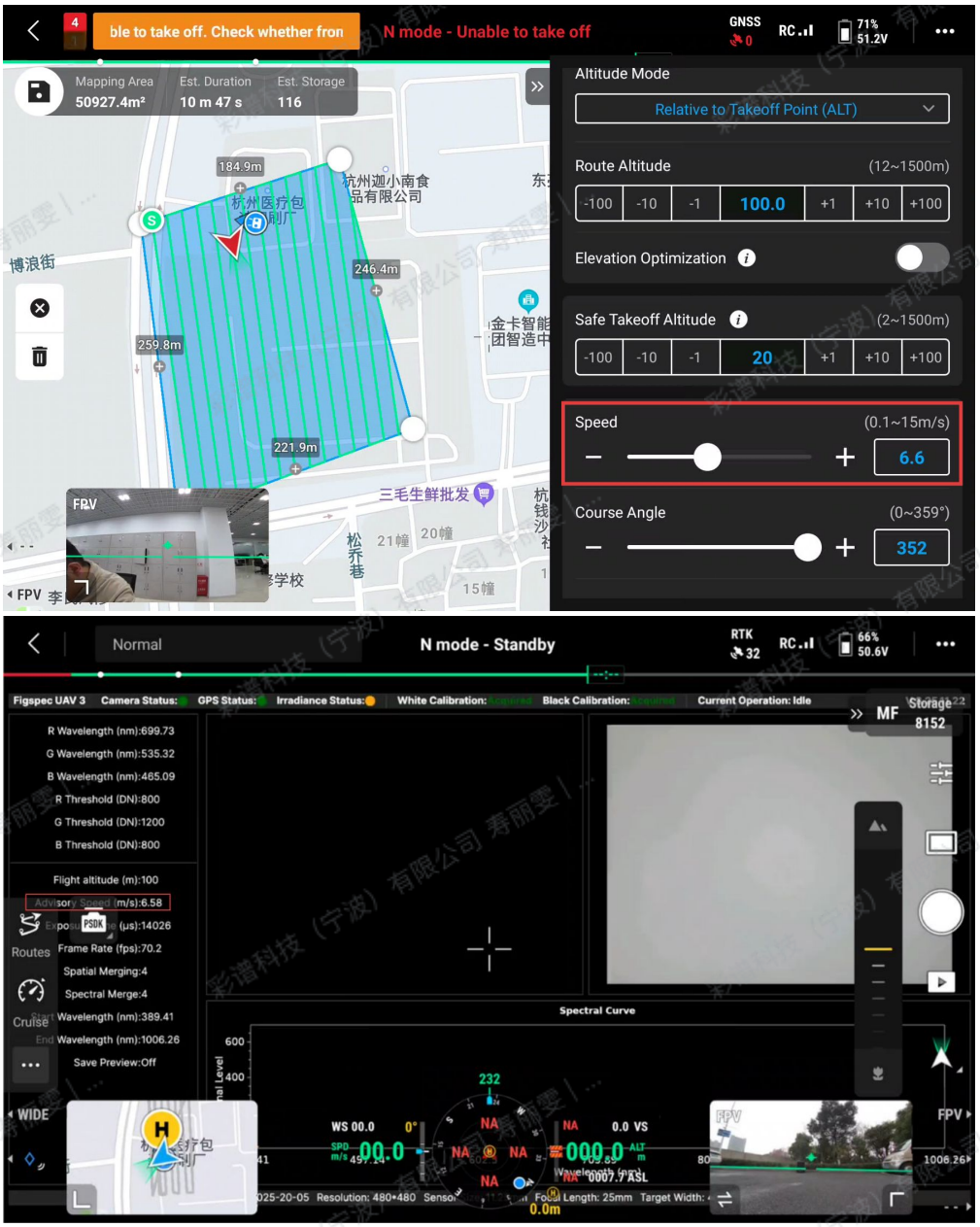
The route altitude in the route task needs to be consistent with the PSDK parameters.





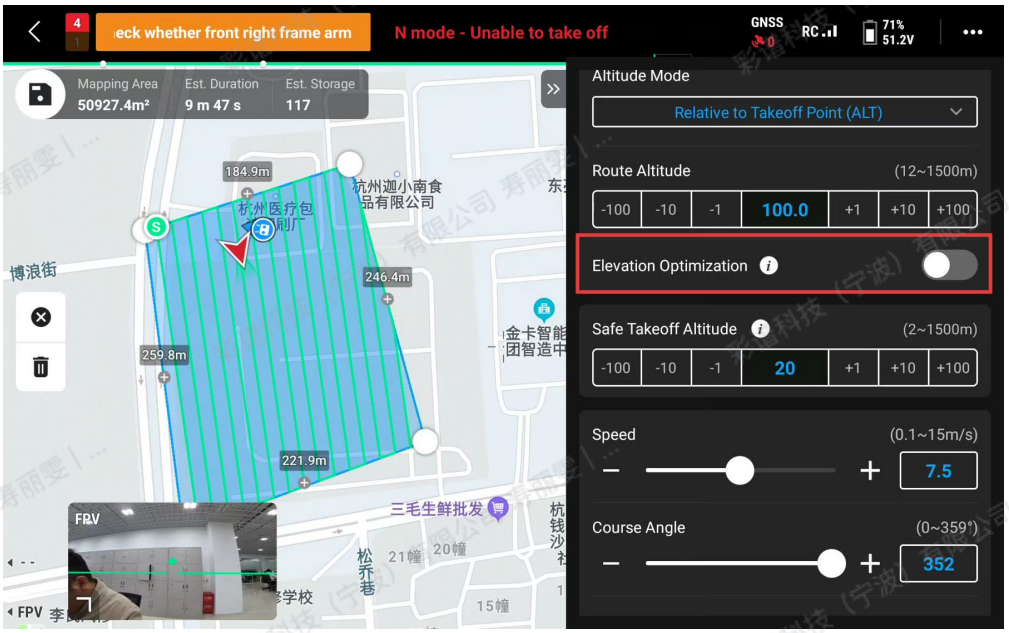
6.6 Set flying speed

The 'fight speed' in the drone route mission needs to be consistent with the 'Advisory speed' on the left side of the software interface.



6.7 Turn off elevation optimization

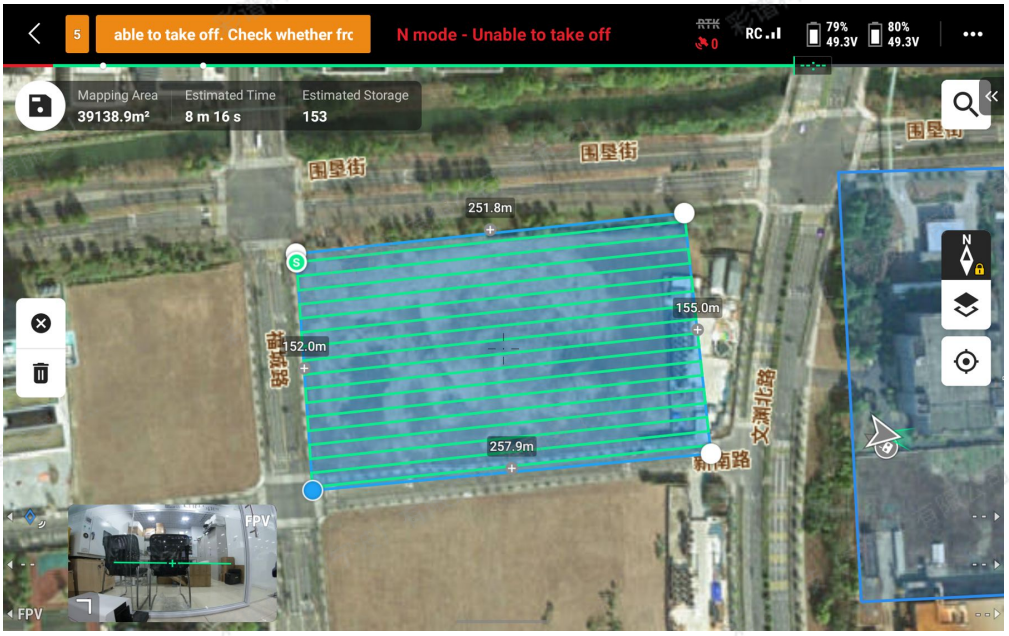
Turn off ”Elevation Optimization'.



7. Route Angle

7.1 When the target area approximates a rectangle

Set the route angle as shown in the figure, not the error example.

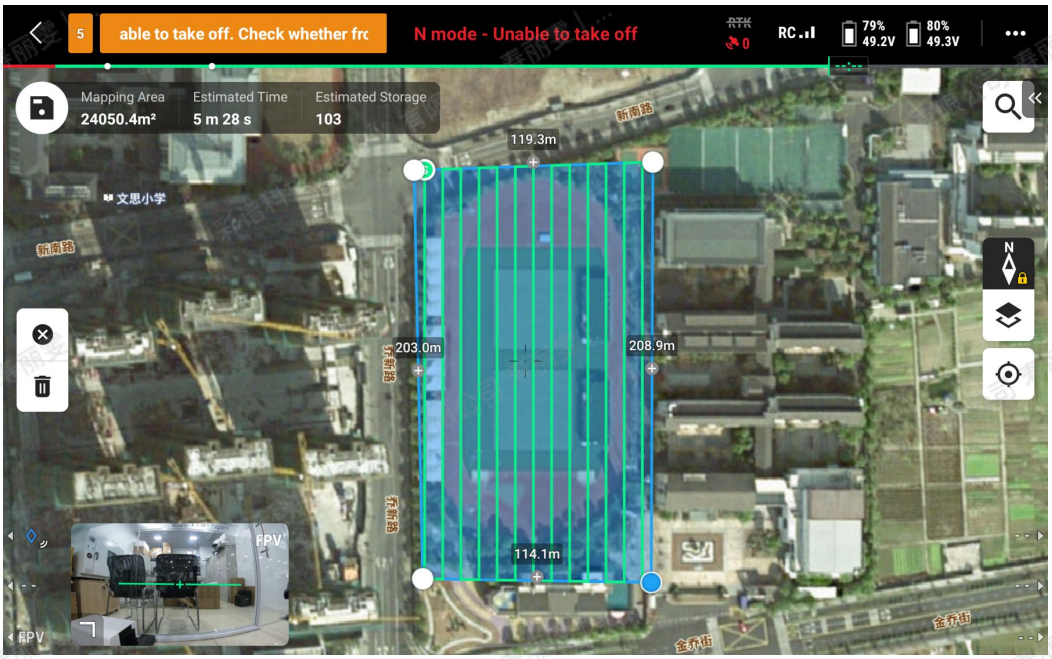




7.2 When the target area is irregular

Take the playground in the figure as an example, use a rectangle to contain the target area, set the measurement area as shown in the figure, and follow the 7.1 rules for the angle of the main route.





7.3 When the target area is a river course

Take the river as an example, set the measurement area as shown in the figure, and adjust the angle of the main route to fly back and forth on both sides of the river bank.





8. Start Grab

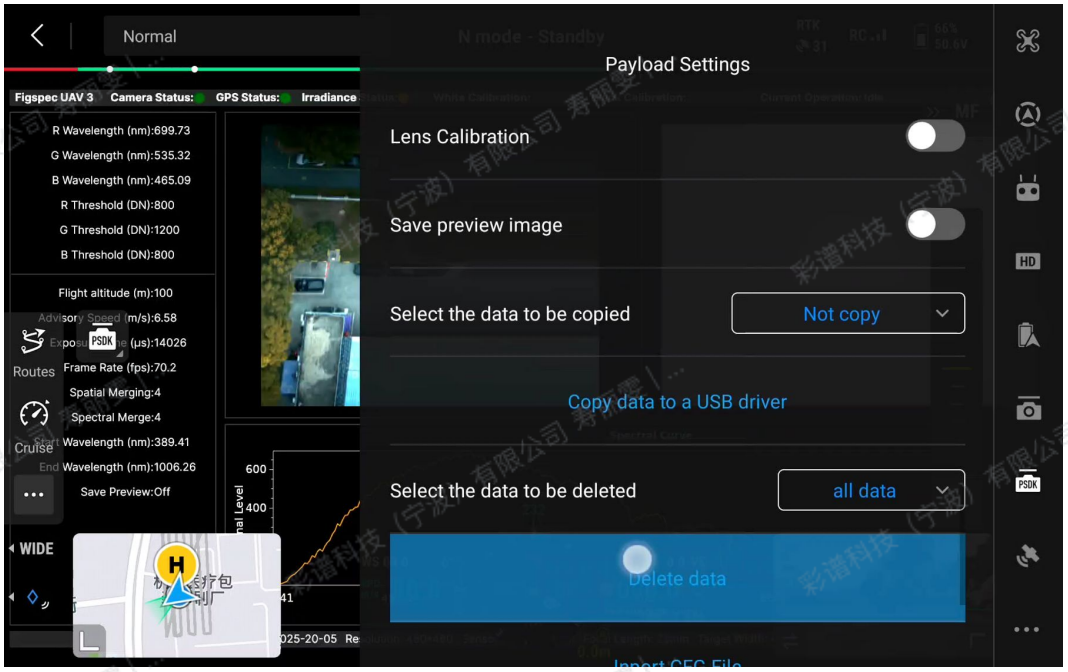
After reaching the starting point, a voice prompt will be given to 'arrive at the starting point of the route and start executing the task'. The camera will rotate 90 degrees upward to observe that the camera is shooting in the air. At this time, click 'Start Grab' (or shortcut C1), the camera will turn to the bottom to carry out the acquisition task, and the hyperspectral image will be refreshed in real time on the hyperspectral image interface.

During the collection process, if the GPS displays red, it means that no GPS information has been obtained.



9. Copy Data

Insert the USB drive into the camera's Type-C port, select the data to be copied in the PSDK, and click 'Copy Data to USB Drive'.



10. Clear Data

In psdk, select the data to be cleared, click 'Delete data', and then click again to 'Confirm' when the prompt appears.

