MANUAL BOOK

V 1.0 – 2020.04

Skyline
RANGER

TSUPORT Q450

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- Searching for Keywords

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- Navigating to a Topic

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- Printing this Document

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Using This Manual

Before Flight

The following materials have been produced to help users make full use of TSUPORT Q450.

1. In the Box
2. Manual Book

Watching all the tutorial videos and reading the User Manual before flight is recommended.

Download the Mission Planner Software

The Mission Planner software is required if using a mobile desktop device connected to the aircraft. Search for Scan the QR code or visit https://firmware.ardupilot.org/Tools/MissionPlanner/ to download the software. Mission Planner compatible with Windows only.

Download the Skyline Ranger Software

The Skyline Ranger Software consists of several packages required to be installed in order to be fully operated. The packages used are:

- Ubuntu 18.04:
  http://releases.ubuntu.com/18.04.4/
- DroneKit-Python:
  https://dronekit-python.readthedocs.io/en/latest/guide/quick_start.html
- Python-OpenCV
- Mono

* For increased safety, the flight is restricted to a height of 30 m and distance of 50 m when not connected or logged into the software during flight, including Mission Planner and all software compatible with Skyline Ranger aircraft.

➢ The operating temperature of this product is -20℃ to 50℃. It does not meet the standard operating temperature for military grade application (-55℃ to 125℃), which is required to endure greater environmental variability. Operate the product appropriately and only for applications that it meets the operating temperature range requirements of that grade.

Contents

Product Profile

This chapter describes the features of the TSUPORT Q450, shows how to assemble the aircraft, and contains diagrams of the aircraft and remote controller with component explanations.

Introduction

The TSUPORT Q450 is a powerful aerial imaging system designed for post disaster search and rescue purpose and smart features that make performing complex task easy. The aircraft's range sensors* and vision sensors* enable enhanced hovering precision and autonomous obstacle avoidance even when flying indoors or in environments where GNSS is unavailable. 915 MHz frequency transmission system makes data downlink more stable and efficient.

* The range and vision sensors systems are affected by surrounding conditions. Read the related section to learn more.

Feature Highlights

The flight controller provides a safe and reliable flight experience. A flight recorder stores critical data from each flight. IMU and barometer design provides redundancy. The aircraft can hover and fly in extremely low altitude and indoor environments, and provides multi-directional obstacle avoidance and vision positioning functions.

The safety beacons on all arms of the aircraft allow the aircraft to be identified at night or in low light conditions. The airframe design gives the aircraft protection in case of collision with obstacles undetected by the sensors.

The low-latency long range (up to 2.5 km to 4.5 km) telemetry downlink is powered by 3DR Robotics. Support of 915 MHz ensures a more reliable connection in environments with more interference. The MAVLink protocol encryption keeps your data transmission secure so you can be sure that your critical information stays safe.

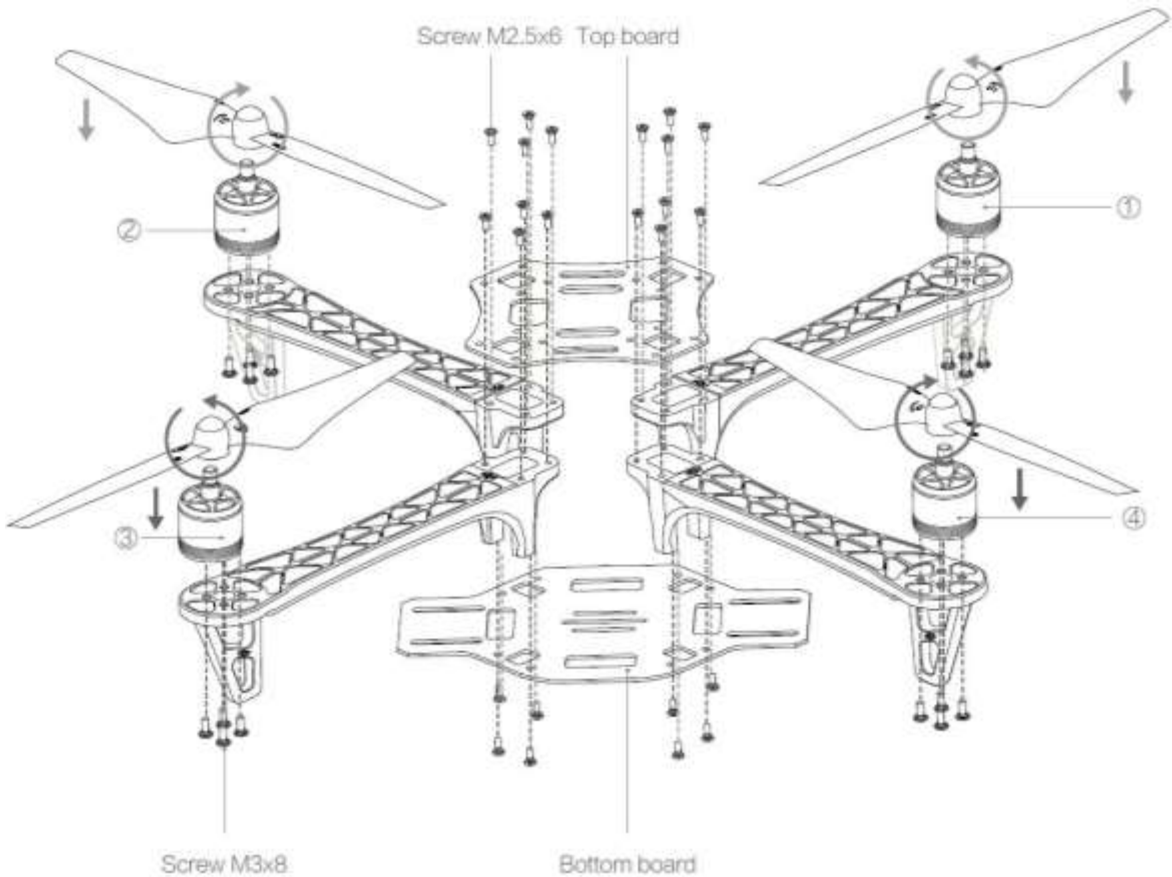
An advanced power management system along with 5200 mAh battery ensures power supply and enhances flight safety. Without payload, the TSUPORT Q450 has a flight time up to 15 minutes with standard batteries.

The camera unit is now independent from image processor so that you have the flexibility to choose the perfect camera system for each of your application. This means that regardless of which camera you choose, you have the same powerful processing backing it.

* The custom-made camera adapter is required when mounting certain camera to the aircraft.

Assemble the Aircraft

Bolt the aircraft parts into the location shown in the figure below:



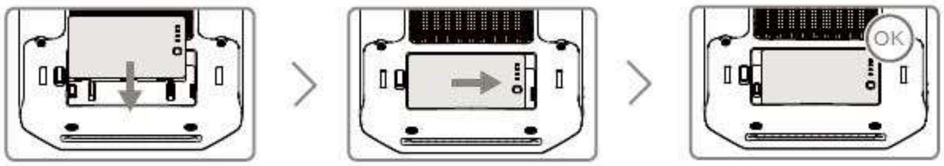
1. Install the bottom board. Note to install the screws by appropriate force to prevent breaking the threads. Use adequate screw glue for installing screws.
2. Connect all the electronics with the flight controller in the center of the bottom board. Make sure the rotation direction of each motor is the same as the way in the figure shows. If not, switch any of two wire connections of the incorrect motor to change its rotation direction.
3. Tidy all cables. Make sure all cables are not be cut by the frame boards and propellers. Smooth out the boards edge if necessary.
4. Install the top board.
5. Install the propellers. Please install the propellers after the flight control system configuration procedure. Make sure the rotation direction of propellers is the same as the figure shows. Tighten the propeller by running it in lock direction. Do not use any thread lock.
6. Bolt the landing gears into the bottom board in the respective bolt thread.
7. Bolt the camera mounting into front part of the bottom board.

> ➢ Check that the propellers are secure before each flight.

8. Bolt the obstacle sensor mounting in the left and right part of the respective part of the bottom board.
9. Place the battery on top of the aircraft and tie it with the provided Velcro holder.

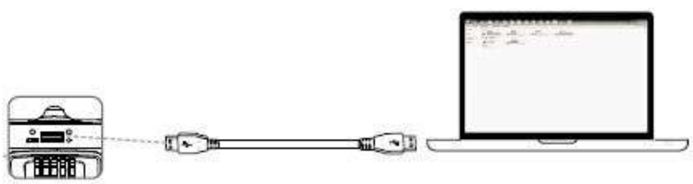
Preparing the Remote Controller

Put the battery into the battery slot, then slide it to the end until you hear a click.

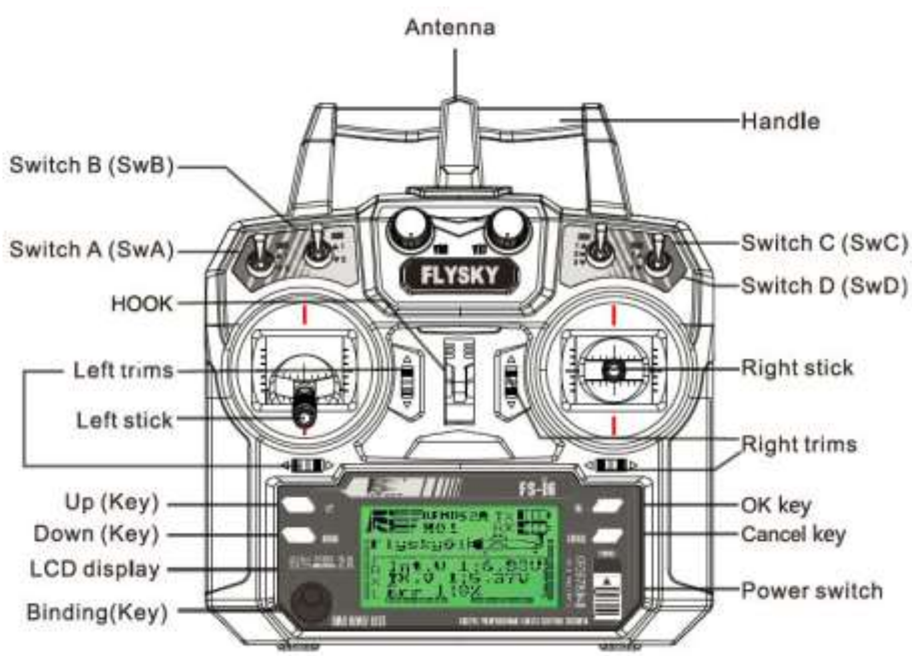


Preparing the Ground Control Station

Turn on your desktop mobile device installed with all the software required and connect the telemetry.



Remote Controller Diagram



Aircraft

This section describes the features of the Flight Controller, Vision System, and the Battery.

Profile

The aircraft includes a flight controller, a communication system, vision systems, a propulsion system and a battery. This section describes the functions of these components.

Flight Mode

The following flight modes are available for the aircraft:

STABILIZE MODE:

STABILIZE MODE allows you to fly your vehicle manually, but self-levels the roll and pitch axis.

ALTITUDE HOLD MODE:

ALTITUDE MODE maintains a consistent altitude while allowing roll, pitch, and yaw to be controlled normally.

AUTO MODE:

AUTO MODE will follow a pre-programmed mission script stored in the autopilot which is made up navigation (i.e. waypoints) and “do” commands (i.e. commands that do not affect the location of the copter including triggering a camera shutter).

RTL MODE:

RTL MODE (Return To Launch) navigates copter from its current position to hover above the home position. The behavior of RTL MODE can be controlled by several adjustable parameters.

LAND MODE:

LAND MODE attempts to bring the copter straight down.

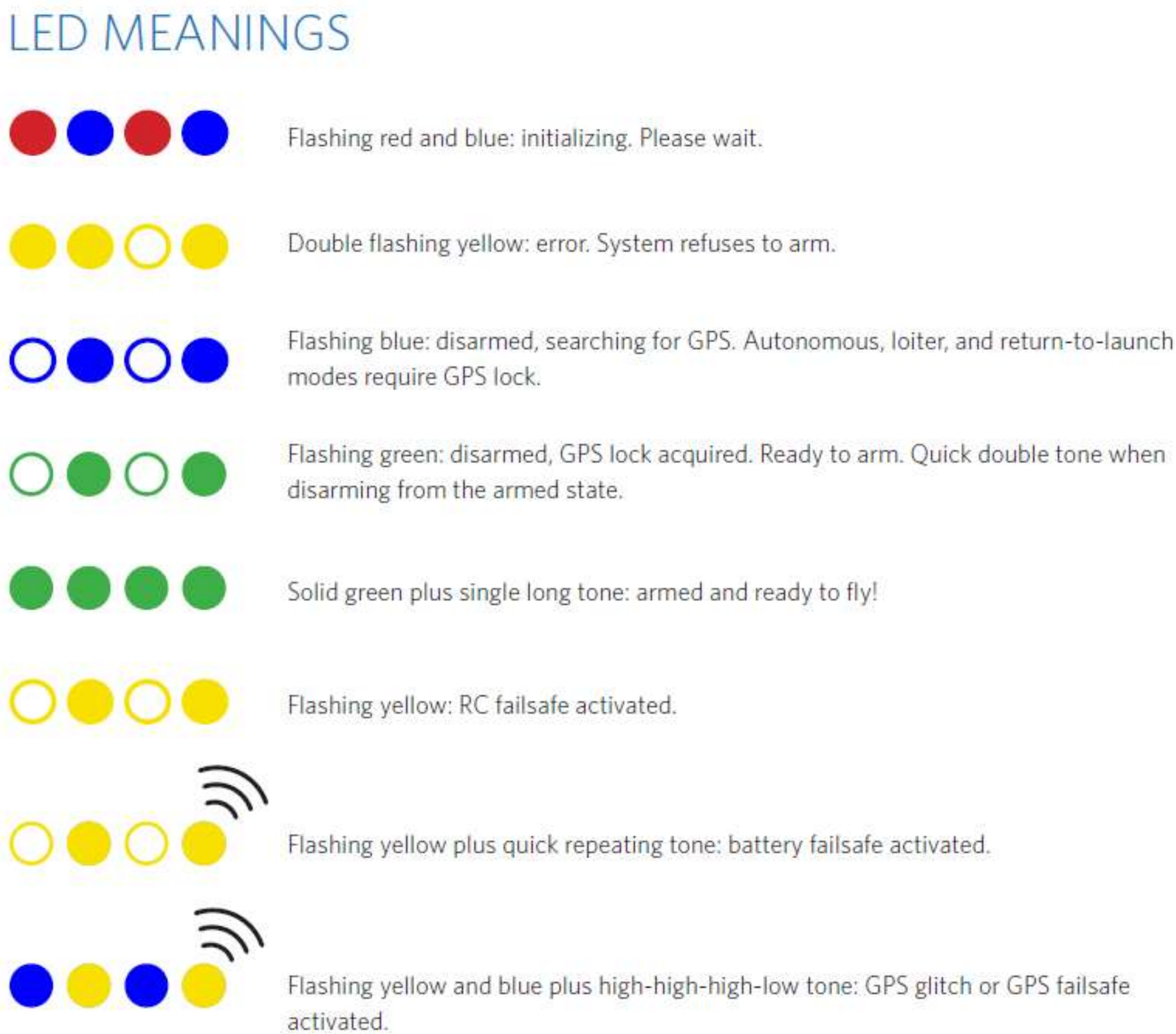
- ➢ STABILIZE MODE is unable to maintains a consistent altitude, please be cautious.
- ➢ AUTO MODE from remote activation will activate after the motor armed.
- ➢ The obstacle avoidance system is active in all mode.

- Use the flight mode (Switch C and D) switch on the remote controller to select aircraft modes.

Flight Status Indicator

The aircraft features Front LEDs, Rear LEDs, and Flight Controller Status Indicators. The Front LEDs and Rear LEDs show the orientation of the aircraft. The Front LEDs glow solid green and the Rear LEDs glow solid red. The Flight Controller Status Indicators communicate the system status of the flight controller. Refer to the table below for more information about the Flight Controller Status Indicators.

Flight Controller Indicator Description



Vision System and Distance Laser Sonar Sensing System

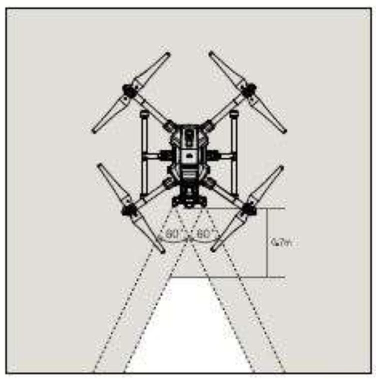
The main components of the Vision System are located on the front and bottom of the aircraft, including FPV Camera sensor and Lidar VL53L0X Distance Laser Sonar sensor.

The Vision System uses image data to help the aircraft maintain its current position, enabling precision hovering indoors or in environments where a GPS signal is not available. The Distance Laser Sonar Sensing System uses Lidar VL53L0X Distance Laser Sonar sensor to constantly scans for obstacles, allowing the aircraft to avoid them by going over, going round, or hovering.

The Distance Laser Sonar Sensing System consists of six Lidar VL53L0X Distance Laser Sonar sensors placed at the bottom, top, right, left, front, and rear side of the aircraft. These scan obstacles on all sides of the aircraft and always active in all flight modes.

- To ensure steady flight and general flight safety, DO NOT block the visual and distance laser sonar sensors.

The detection range of the vision system is depicted below. Note that the aircraft cannot sense and avoid obstacles that are not within the detection range.



- The aircraft cannot detect objects in the grey area. Please fly with caution.

Distance laser sonar sensor detection range is depicted below.

The Vision System is activated automatically when the aircraft is turned on. No further action is required. The aircraft is able to actively brake when obstacles are detected in front, rear, right, left, below, and above of the aircraft. The aircraft must fly at no more than 34 mph (54 kph) with a maximum pitch angle of 25° to allow for sufficient braking distance.

Flight Recorder

Flight data is automatically recorded to the internal storage of the aircraft. You can connect the aircraft to a computer via USB port and export this data via Mission Planner Dataflash Logs.

Remote Controller

This section describes the features of the remote controller that includes aircraft and remote controller operations.

Remote Controller Profile

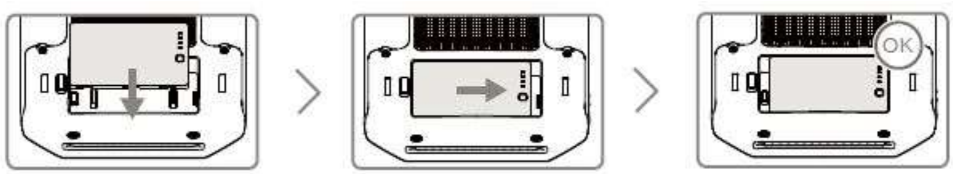
The FLYSKY FS-i6 remote controller features 2.4 GHz frequency for a maximum transmission distance of up to 50 m. It has a screen that is primarily used to display aircraft parameters, providing a precise and responsive flying experience.

The remote controller works with 6 AA batteries of any kind, rechargeable or not. The maximum run time of the remote controller is approximately 24 hours.

* The remote controller can reach its maximum transmission distance in an unobstructed area with no electro-magnetic interference at an altitude of about 400 feet (120 meters). The actual maximum transmission distance maybe less than the distance mentioned above due to interference in the operating environment, and actual value will fluctuate according to the strength of interference.

Preparing the Remote Controller

Put the batteries into the Battery Slot, then slide it to the end until you hear a click.



Remote Controller Operations

Users can use the preconfigured throttle/direction to control the aircraft and can also assign functions to the customizable switch through Mission Planner software. There are three types of switch:

1. Preconfigured throttle/direction for aircraft control.
2. Preconfigured switch for flight modes
3. Customizable switch and knobs that you can set through Mission Planner software.

Follow the steps below to turn the remote controller on and off.

1. Please make sure that the switch assigned are all at the off position.
2. Slide the power slider to the upper end until the remote turned on. If a warning message appear, please re-check all the switch are at the off position and it there are any on switch please change it to the off position.
3. Slide the power slider to the lower end until the remote turned off.

Toggle the switch to select the desired flight mode. Choose between; STABILIZE MODE, ALTITUDE HOLD MODE, AUTO MODE, and LAND MODE.

Remote Controller Screen Descriptions

The remote controller of TSUPORT Q450 has a screen that is primarily used to display aircraft parameters.

Besides Fly Sky logo and modulation type (AFHDS2A), the main screen displays the following information:

1. Selected model number (1 to 20): 20 different models can be saved in the transmitter allowing you to instantly switch to 20 different models.
2. Model name: each model can be named with 8 characters name that allow you to easily recognize the associated model.
3. An aircraft or helicopter picture that indicates the type of the selected model.
4. The four electronic trims position.
5. The battery status and voltage. Icon blinks and alarm when the battery voltage drops below 4.2 V. Below 4.0 V, icon blinks and alarm shortly.
6. Feedback sensor data from RX (unique character of two-way communication system).

For detailed information, please refer to this site https://www.flysky-cn.com/s/FS-i6-User-manual-20160819.pdf

Camera

This section focuses on the technical specifications of the camera and explains how to use it.

Camera Profile

Using the FPV Camera as an example, this section will demonstrate the technical specifications of the camera.

Sensor	1/3.2” CMOS; Effective Pixels 4 M
Lens	2.1 mm, f/2.1
Shutter	None
FOV	150°(D); 122°(H); 93°(V)
Dimension	22.1 × 21.1 × 20.1 mm
Weight	8.2 gr

Video Sender

The video sender provides live streaming of the camera to the Ground Control Station via Python Script Program.

Channel	40 C
Frequency	5.6 – 5.9 GHz
Current	190 mA/12 V
Temp	-10 – 85℃
Video Bandwidth	8 M
Audio Bandwidth	6.5 M
Antenna	RP-SMA
Size	38 × 18 × 8 mm

Mission Planner

This section introduces the main functions of the Mission Planner software.

The Mission Planner software is specifically developed for basic until developer users. Manual flight integrates a variety of professional features that make flying simple and intuitive. Mission flight supports flight planning, that allows you to control the drone automatically, making your workflow much simpler and more efficient.

Manual Flight

The aircraft parameters all the time is shown at the left side of the screen.

Mission Flight

Mission flight is using AUTO MODE to flight to the given waypoints and execute certain mission. It provides a filtered list of the commands appropriate for the current vehicle type, and adds column headings for the parameters that need user-supplied values. These include navigation commands to travel to waypoints and loiter in the vicinity, DO commands to execute specific actions (for example taking pictures), and condition commands that can control when DO commands are able to run.

For detailed information, please refer to this site https://ardupilot.org/planner/.

Skyline Ranger Software

This section describes the installation procedures of the packages used in Skyline Ranger Software.

Skyline Ranger Software use several packages with the certain version (please refer to Table 3 in appendix). Skyline Ranger Software run best in Ubuntu 18.04, but it is also able to run on Windows. This packages installation applied to both operating systems. This instruction must be done via terminal (in Windows → Command Prompt/Windows Power Shell).

For Ubuntu, please update all the packages installed in the operating system using:

```
$sudo apt update
```

- DroneKit-Python:
  DroneKit-Python and the dronekit-sitl simulator are installed from **pip** on all platforms. On Linux you will first need to install **pip** and **python-dev**:

```
$sudo apt-get install python-pip python-dev
```

  pip is then used to install dronekit and dronekit-sitl. Linux may require you to prefix these commands with sudo:

```
$pip install dronekit
$pip install dronekit-sitl
```

- Python-OpenCV:

```
$sudo apt install python-opencv
```

  After Python-OpenCV is installed, you also need to install PySerial package to unlock more python script features:

```
$sudo pip install pyserial
```

- Mono:
  Mono is used to run Mission Planner on Ubuntu OS by running command on terminal:
  *This command must be executed in the folder containing the MissionPlanner.exe.

```
$sudo mono MissionPlanner.exe
```


Mono requires to install the necessary packages:

```
$sudo apt install dirmngr gnupg apt-transport-https ca-
 certificates
```

Import the repository’s GPG key using:

```
$sudo apt-key adv --keyserver hkp://keyserver.ubuntu.com:80 --
 recv-keys 3FA7E0328081BFF6A14DA29AA6A19B38D3D831EF
```

Add the Mono repository to your system source’s list using:

```
$sudo sh -c 'echo "deb https://download.mono-
 project.com/repo/ubuntu stable-bionic main" >
 /etc/apt/sources.list.d/mono-official-stable.list'
```

Install Mono:

```
$sudo apt install mono-complete
```


Manual Flight

This section describes safe manual flight practices and flight restrictions.

Once pre-flight preparation is complete, it is recommended to use the flight simulator you can find at the Skyline Ranger website to hone your flight skills and practice flying safely. Ensure that all flights are carried out in an open area. It is important to understand basic flying guidelines for the safety of both you and those around you.

Flight Environment Requirements

1. Do not use the aircraft in severe weather conditions. These include wind speeds exceeding 12 m/s, snow, rain, and fog.
2. When flying in open areas, tall and large metal structures may affect the accuracy of the onboard compass.
3. Avoid obstacles, crowds, high voltage power lines, trees, and bodies of water.
4. Minimize interference by avoiding areas with elevated levels of electromagnetism, including base stations and radio transmission towers.
5. Aircraft and battery performance are subject to environmental factors such as air density and temperature. Be very careful when flying at high altitudes, as battery and aircraft performance may be affected.

Preflight Checklist

1. Remote controller, aircraft controller, and display device are fully charged.
2. Frame arms are tightly bolted and locked firmly, and landing gear are tightly bolted and mounted firmly.
3. All the device’s firmware is up-to-date.
4. MicroSD card has been inserted to the flight controller.
5. Vision System and Distance Laser Sonar Sensing System are on.
6. Motors can start and are functioning normally.
7. The Mission Planner software is successfully connected to the aircraft.
8. Ensure that the sensors for the Vision and Distance Laser Sonar Sensing Systems are clean.

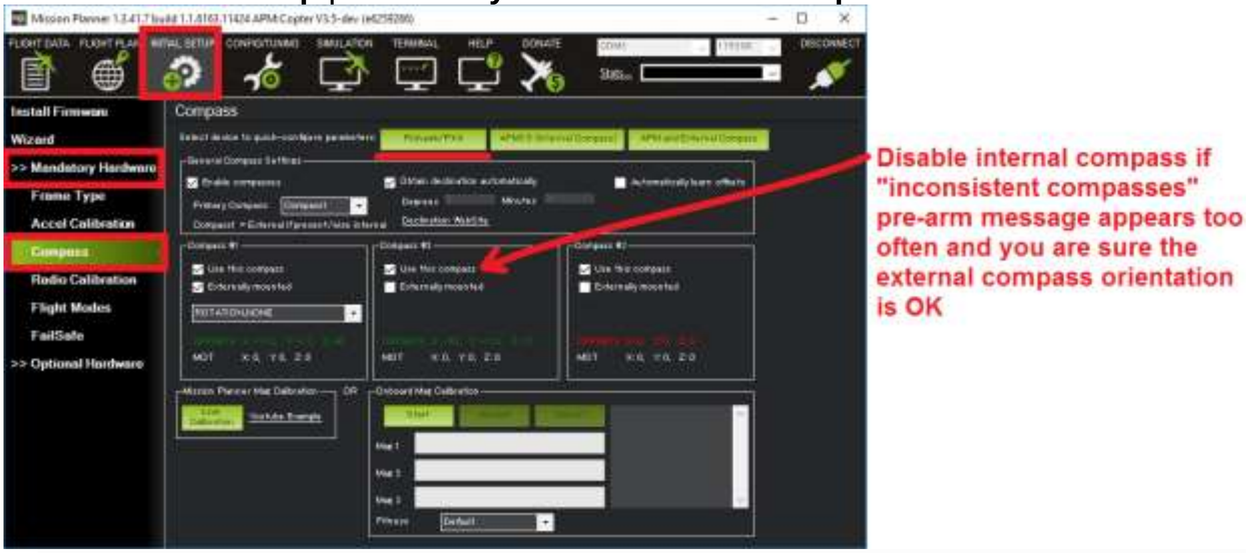
Calibrating the Compass

Only calibrate the compass when Mission Planner software prompts you to do so or after crash. Observe the following rules when calibrating your compass.

- DO NOT calibrate your compass where there is a chance of strong magnetic interference, such as near magnets, parking structures, or steel reinforcements underground.
- DO NOT carry ferromagnetic materials with you during calibration such as cellular phones.

- The Mission Planner software will notify you if the compass is affected by strong interference after calibration is complete. Follow the prompts to resolve the compass issue.

Calibration Procedures
Choose an open area to carry out the following procedures.
1. Under **Initial Setup | Mandatory Hardware** select **Compass**.



- You normally shouldn't need to change any of the "General Compass Settings" or compass specific values (i.e. "Compass #1" section), but you might want to confirm that the **Enable compasses** and **Obtain declination automatically** boxes are checked.
- You may wish to disable any internal compasses if you are consistently seeing the "inconsistent compasses" pre-arm message often and you are sure that the external compass is calibrated and the orientation is correct.

2. Click the "Onboard Mag Calibration" section's "Start" button. If your autopilot has a buzzer attached you should hear a single tone followed by short beep once per second.
3. Hold the vehicle in the air and rotate it so that each side (front, back, left, right, top and bottom) points down towards the earth for a few seconds in turn. Consider a full 360-degree turn with each turn pointing a different direction of the vehicle to the ground. It will result in 6 full turns plus possibly some additional time and turns to confirm the calibration or retry if it initially does not pass.

4. As the vehicle is rotated the green bars should extend further and further to the right until the calibration completes,

5. Upon successful completion three rising tones will be emitted and a “Please reboot the autopilot” window will appear and you will need to reboot the autopilot before it is possible to arm the vehicle.

If calibration fails:

1. You will hear an “unhappy” failure tone, the green bars may reset to the left, and the calibration routine may restart (depending upon the ground station). Mission Planner will automatically retry, so continue to rotate the vehicle as instructed above.
2. If a compass is not calibrating, consider moving to a different area away from magnetic disturbances, and remove electronics from your pockets.
3. If, after multiple attempts, the compass has not passed the calibration, Press the “Cancel” button and change the “Fitness” drop-down to a more relaxed setting and try again.
4. If compass calibration still fails it may help to raise COMPASS_OFFS_MAX from 850 to 2000 or even 3000.
5. Finally, if a single compass is not calibrating and you trust the others, disable it.

- DO NOT calibrate the compass near metal objects such as a metal bridge, cars, scaffolding.

Autonomous Flight

This section describes safe autonomous flight mission after the manual flight requirement is fulfilled, flight restrictions and starting the mission.

Flight Environment Requirements

1. Do not use the aircraft in severe weather conditions. These include wind speeds exceeding 12 m/s, snow, rain, and fog.
2. When flying in open areas, tall and large metal structures may affect the accuracy of the onboard compass.
3. Avoid obstacles, crowds, high voltage power lines, trees, and bodies of water.
4. Minimize interference by avoiding areas with elevated levels of electromagnetism, including base stations and radio transmission towers.
5. Aircraft and battery performance are subject to environmental factors such as air density and temperature. Be very careful when flying at high altitudes, as battery and aircraft performance may be affected.

Flight Restrictions

1. Remote controller, aircraft controller, and display device are fully charged.
2. Frame arms are tightly bolted and locked firmly, and landing gear are tightly bolted and mounted firmly.
3. All the device's firmware is up-to-date.
4. MicroSD card has been inserted to the flight controller.
5. Vision System and Distance Laser Sonar Sensing System are on.
6. Motors can start and are functioning normally.
7. The Mission Planner software is successfully connected to the aircraft.
8. Ensure that the sensors for the Vision and Distance Laser Sonar Sensing Systems are clean.
9. A mission had been inserted into the flight controller via Mission Planner or the Python script is ready. For detailed information, please refer to this site https://ardupilot.org/copter/docs/common-mission-planning.html

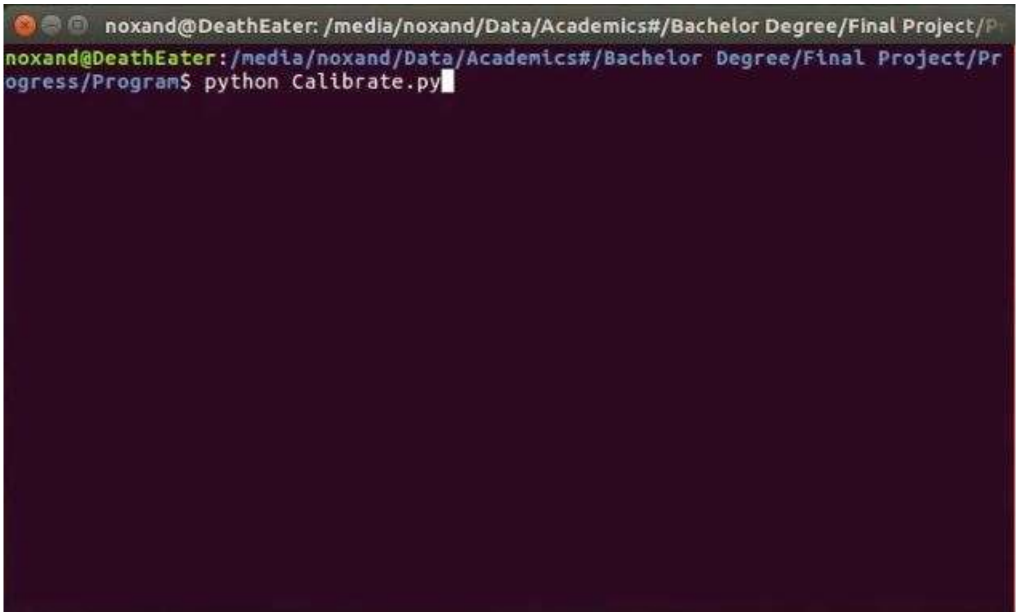
Starting the Mission

The autonomous flight mission could be activated via Mission Planner or Python script. If the mission is from Mission Planner, simply switch to change the flight mode into AUTO MODE. If the mission is from Python script, please follow the steps below.

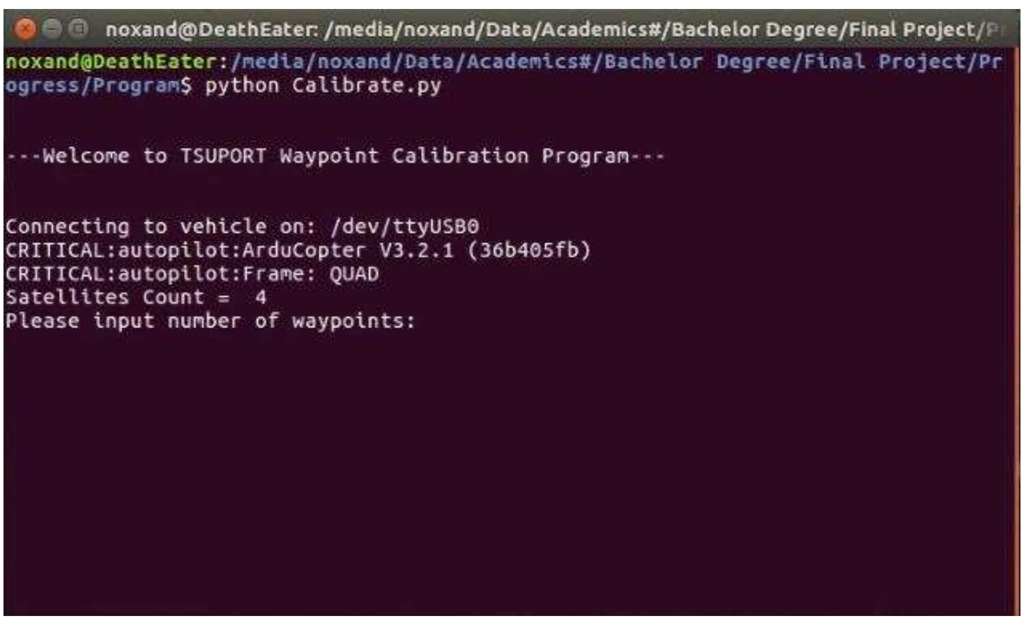
* Please make sure that the copter is on and the telemetry of Ground Control Station and copter is connected.

- Waypoints Calibration:
  - Open the terminal in the folder where the calibration program is placed.
  - Type this line in the terminal and press enter.

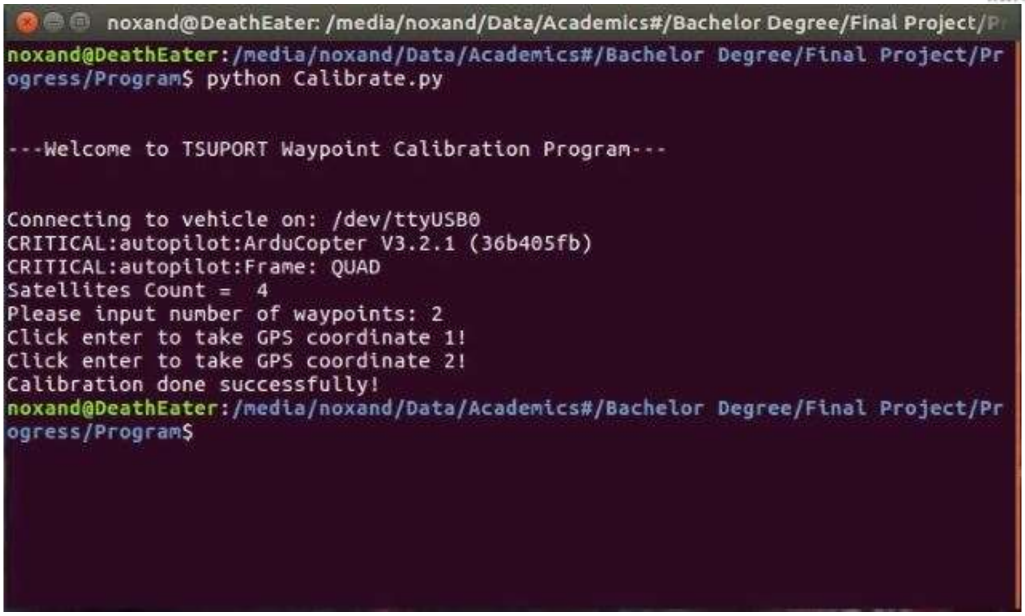

```
$python Calibrate.py
```



- The display is shown as below and please insert how many waypoints you want to fly to, then press enter.



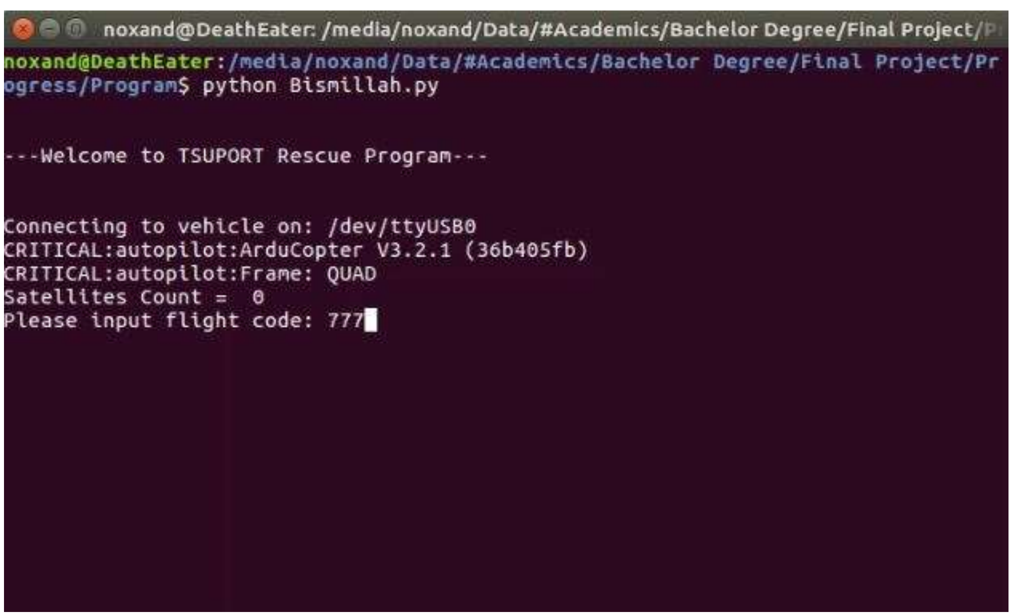
- Place the vehicle in the desired waypoint locations and press enter on the terminal.
- Repeat to the step above in accordance with how many you input the waypoints in the program.
- If the calibration success and done, the program will display as below.



- Python Script Execution:
  - Open the terminal in the folder where the calibration program is placed.
  - Type this line in the terminal and press enter.

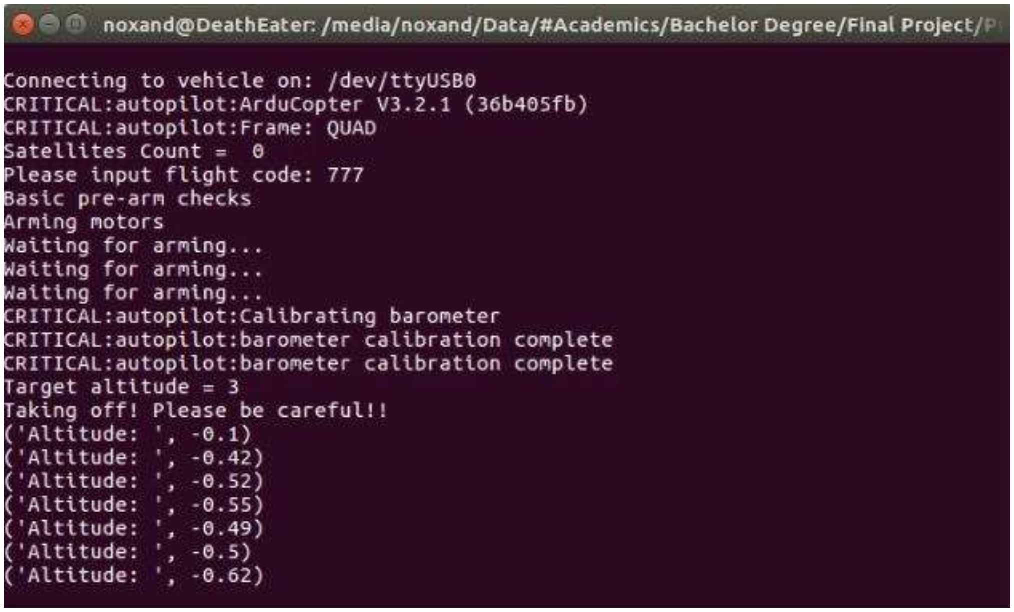
```
$python Bismillah.py
```

- After enter the line above, the display of the program will be as shown below.



- After the program finished initializing, the program will require you to insert the flight password for safety reason. The password is 777.

- After entering the password, the copter will arm the motors and takeoff and execute the mission given before. The display of the program is as shown below.



```
noxand@DeathEater: /media/noxand/Data/#Academics/Bachelor Degree/Final Project/P

Connecting to vehicle on: /dev/ttyUSB0
CRITICAL:autopilot:ArduCopter V3.2.1 (36b405fb)
CRITICAL:autopilot:Frame: QUAD
Satellites Count =  0
Please input flight code: 777
Basic pre-arm checks
Arming motors
Waiting for arming...
Waiting for arming...
Waiting for arming...
CRITICAL:autopilot:Calibrating barometer
CRITICAL:autopilot:barometer calibration complete
CRITICAL:autopilot:barometer calibration complete
Target altitude = 3
Taking off! Please be careful!!
('Altitude: ', -0.1)
('Altitude: ', -0.42)
('Altitude: ', -0.52)
('Altitude: ', -0.55)
('Altitude: ', -0.49)
('Altitude: ', -0.5)
('Altitude: ', -0.62)
```

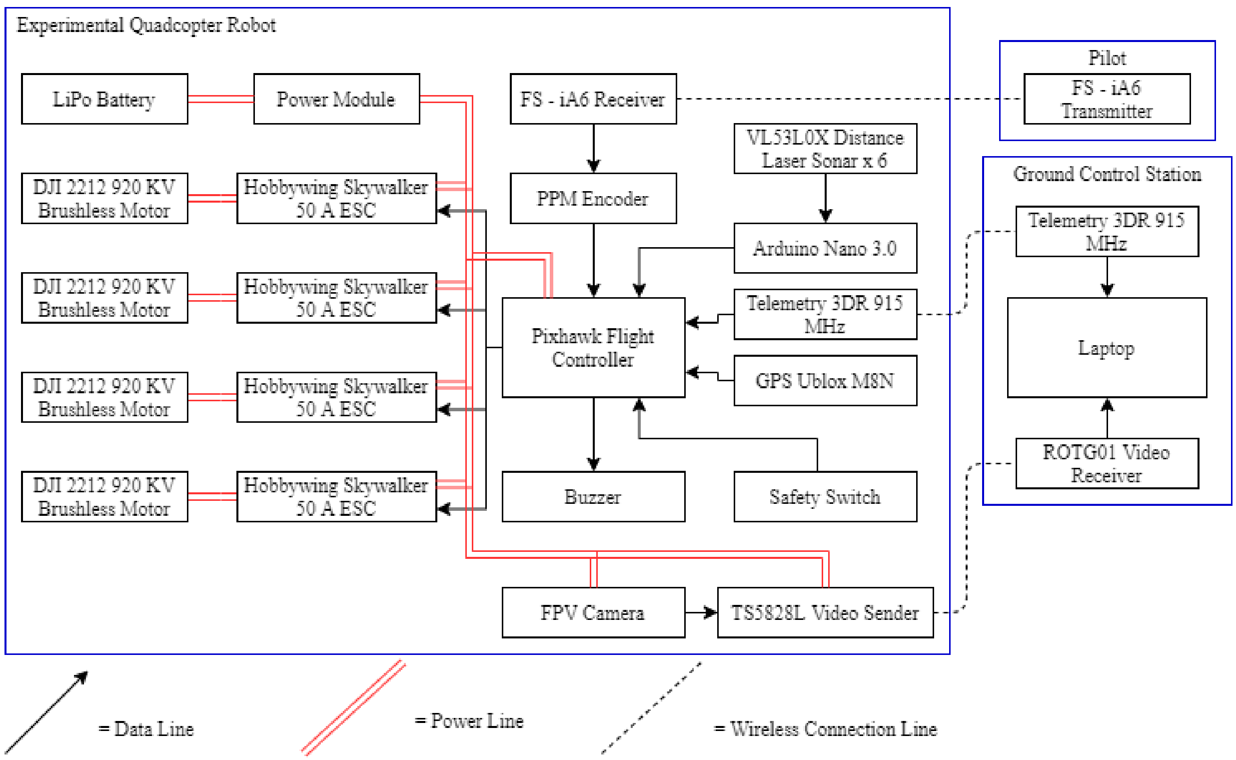

TROUBLESHOOTING

This section describes the recommended troubleshooting and maintenance method for TSUPORT Q450.

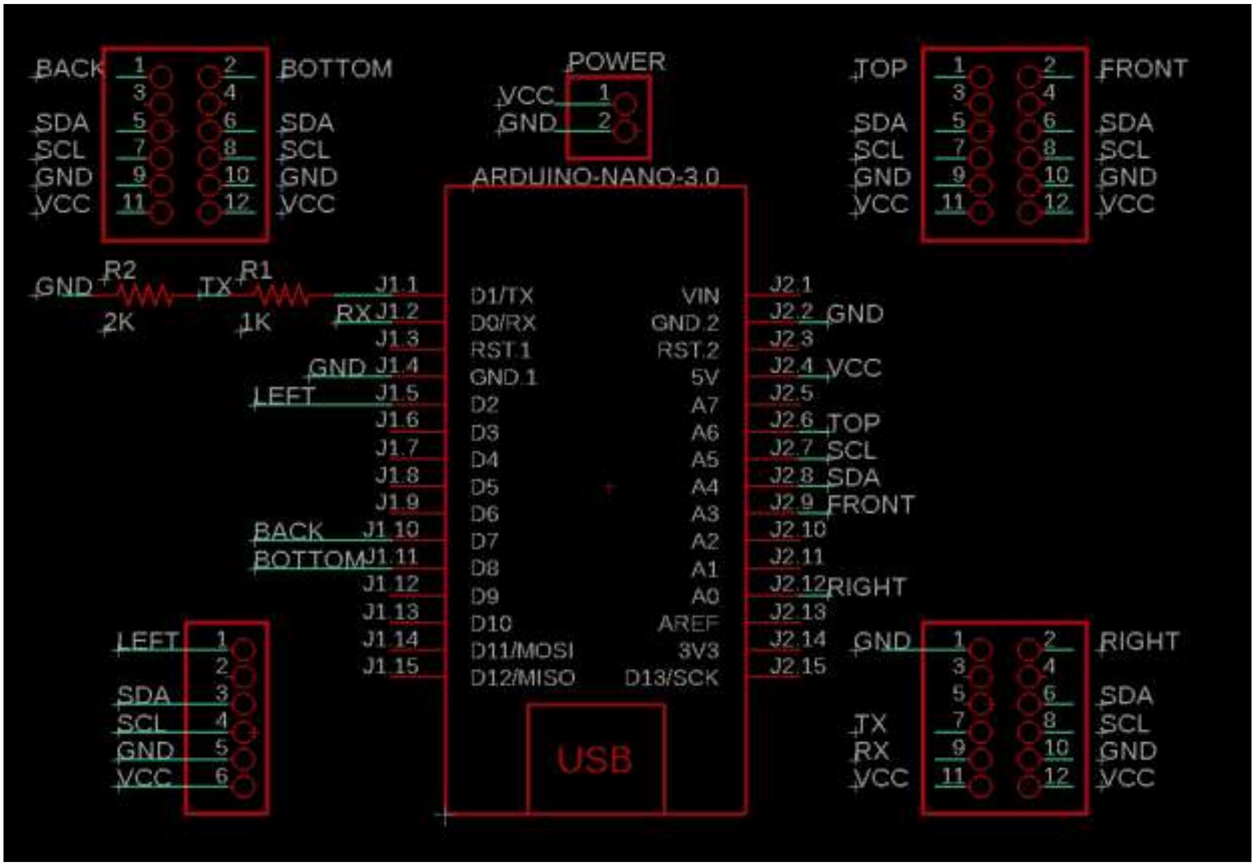
Hardware Diagram

The hardware connection is shown as the picture below.

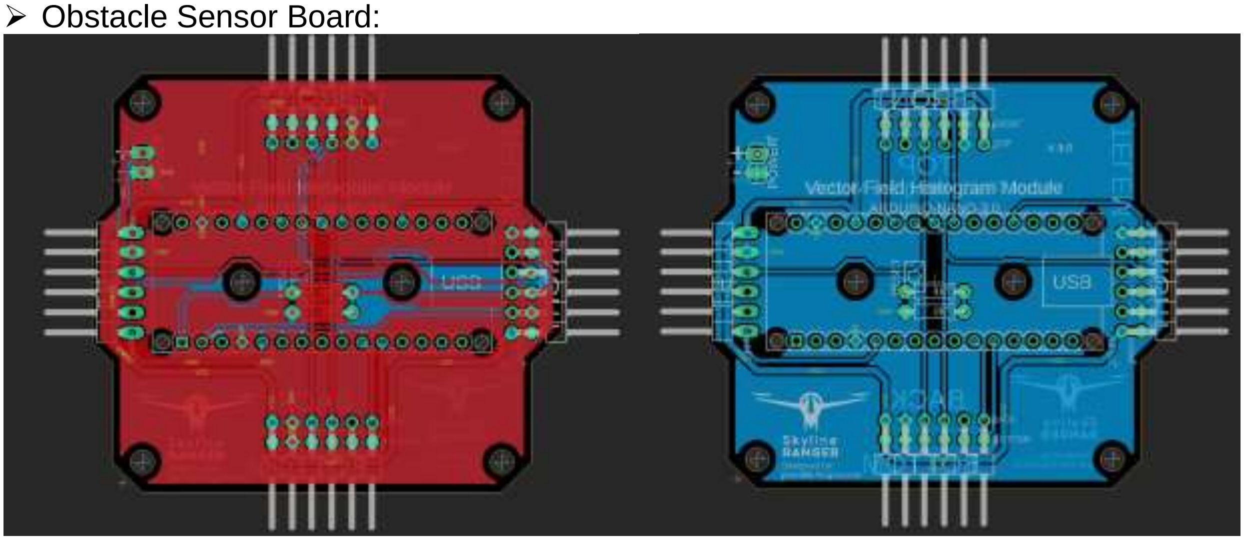
* In case one of the hardware suddenly fails, it is recommended to check the power distribution connection based on the diagram below.
* In case of the data connection from one of the hardware is not connected, it is recommended to check the data line based on the diagram below.



➢ Obstacle Sensor Schematic:



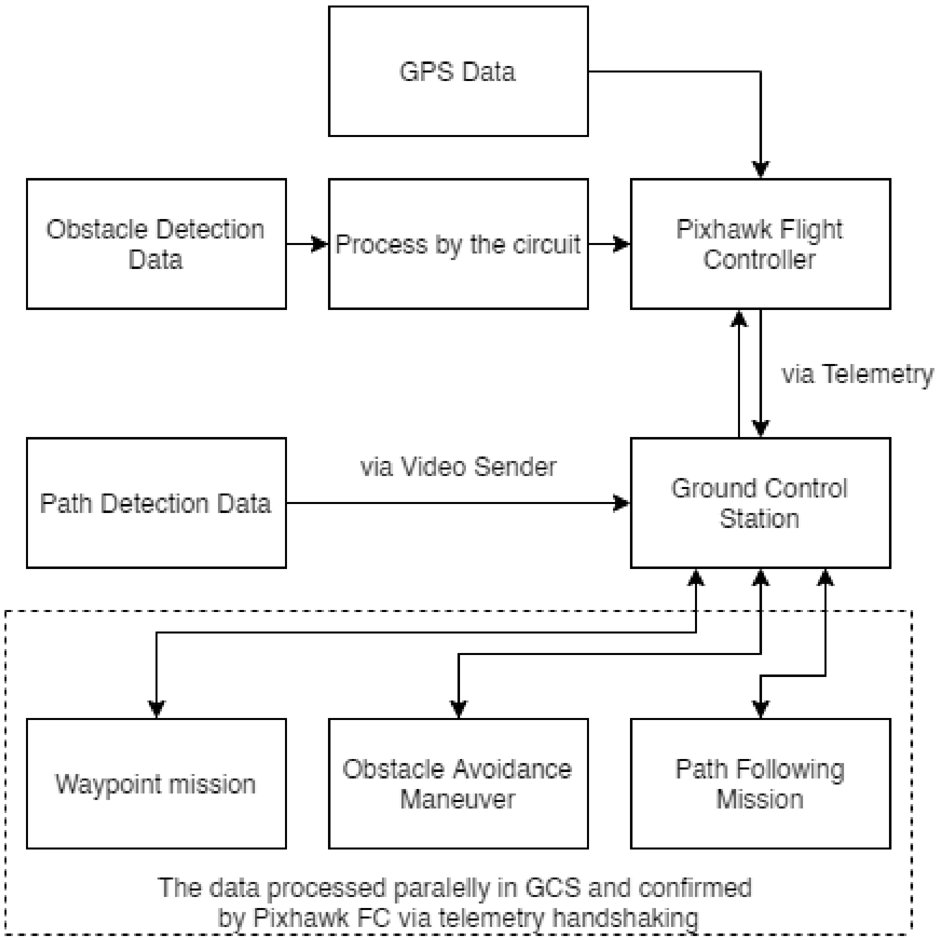
➢ Obstacle Sensor Board:



Top View Bottom View

System Diagram

The system diagram is showing the data flow from the obstacle and image sensors to the flight controller until ground control station to be processed as shown below.



Troubleshooting Table

The troubleshooting table is shown as below with the solution in order to solve the problem.

Problem	Solution
Copter unable to turn on	Check the battery voltage
	Check the power cable
	Check the power module
Unable to connect telemetry	Restart the telemetry with the switch in the cable
	Restart the power
	(Via Mission Planner) Check port connection and baudrate

Error appear on HUD	Recalibrate
	Replace with new microSD card
	Reflash the firmware, then recalibrate
Permission denied	Type this line in the terminal: sudo chmod -R 777 /dev/ttyUSB0
Copter twitching motion	Retune PID
One motor twitching	Check ESC cable
	Replace the broken motor
Broken propeller	Replace the broken propeller
Broken landing gear	Replace the broken landing gear
Image does not appear	Check the port connection in the program
	Check cable connection of the video sender and camera
Obstacle sensor not detecting	Check the parameter setting via Mission Planner
	Check cable connection
	Replace the broken sensor

Appendix

Specifications

Frame	
Diagonal Wheelbase Diameter	450 mm
Frame Weight	282 g
Takeoff Weight	800 g ~ 1600 g
Landing Gear Weight (Single)	17.5 g
Electronic Speed Controller Hobbywing Skywalker 50 A	
Max Allowable Voltage	17.4 V
Max Allowable Current (Persistent)	50 A
Max Allowable Peak Current (3 seconds)	65 A
PWM Input Signal Level	3.3 V/5 V Compatible
Signal Frequency	50 Hz ~ 432 Hz
Battery	2 ~ 4 S LiPo, 5 ~ 12 S NiMH
Weight	41 g
Motor DJI 2212 920 KV Brushless Motor	
Stator Size	22 × 12 mm
KV	920 rpm/V
Weight	52 g
Propeller	
Diameter/Thread Pitch	9.4 × 5.0 inch
Weight (Single)	13 g

Weight Details:

Component	Weight (g)	Amount	Sum (g)
DJI F450 Frame	282	1	282
Landing Gears	17.5	4	70
Pixhawk Flight Controller	38	1	38
Flight Controller Shock Damper	12	1	12
Hobbywing Skywalker 50 A ESCs	41	4	164
DJI 2212 920 KV Brushless Motors	52	4	208
9450 Self Locking Propellers	17	4	68
Propeller Guard	31.25	4	125
Telemetry 3DR 915 MHz	4	1	4
5200 MAh 3S LiPo Battery	500	1	500
TS5828L Video Sender	16	1	16
GPS Ublox M8N	30	1	30
GPS Antenna Mount	20	1	20
PPM Encoder	9	1	9
FS - iA6 Receiver	9	1	9
FPV Camera	72	1	72
Power Module	17	1	17

VL53L0X Distance Laser Sonar	0.5	6	3
Arduino Nano 3.0	7	1	7
Total			1654

Software Version

Software	Version
Python Pip*	9.0.1
Python*	2.7.17
DroneKit	2.9.2
Future	0.18.2
LXML	4.5.1
Monotonic	1.5
PyMAVLink	2.4.8
DroneKit SITL	3.3.0
PSutil	5.7.0
Python OpenCV*	3.2.0
PySerial	3.4
ArduCopter	4.0.3
Mission Planner	1.3.71
Mono	6.8.0.123

* The version used is the old version due to the compatibility of all packages.

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