INSPIRED FLIGHT

IF1200 Hexacopter

HereLink Blue
HereLink Black
LRT

User Manual

Document Number: 102090

Address: 225 Suburban Rd, San Luis Obispo, CA 93401

On the Web: **https://inspiredflight.com/**

Contact us:

- **Phone**: (805) 776-3640
- **Email**: support@inspiredflight.com.

Table of Contents

1. Safety Information and Notes

The IF1200 is a high-performance system, engineered for safe use. Where appropriate, this manual alerts the user to specific actions necessary for safe operation of the aircraft.

The following symbols are used:

Symbol	Meaning
	General alert to an action or condition that may affect the safe operation of the equipment.
	Indicates a hazardous situation that, if not avoided, can result in death or serious injury.
	Indicates hazards or unsafe practices which could result in severe personal injury or death
	Indicates hazards or unsafe practices which could result in minor personal injury or equipment damage.

NOTE	Offers important information about a topic.

2. IF1200 Overview

The IF1200 is an American-made, NDAA-compliant heavy-lift hexacopter. This User Manual describes how to utilize the full functionality of this aircraft to meet your most demanding needs.

There are three models of the IF1200, which differ according to the hand controller they use:

- IF1200 HereLink Blue: uses the Union Robotics HereLink Blue hand controller
- IF1200 HereLink Black: uses the Cube Pilot HereLink hand controller
- IF1200 Long Range Telemetry (LRT): uses the Jeti DS-12 hand controller in conjunction with the RFD900x-US radio.

All three versions of the IF1200 are identical except for the hand controller. This User Manual describes all three versions.

Figure 1 below shows major components of the IF1200 aircraft. Figure 2 on the next page shows the front view of the aircraft,

Orientation: In this manual, the side of the IF1200 that has the GPS mast is referred to as the "front" of the aircraft.

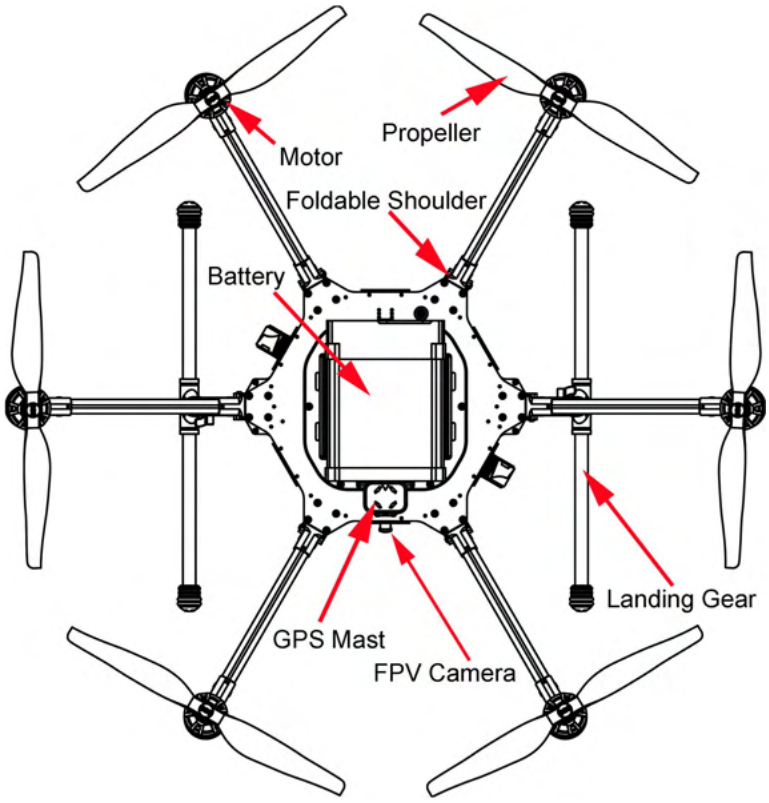


Figure 1. IF1200 (Top View)

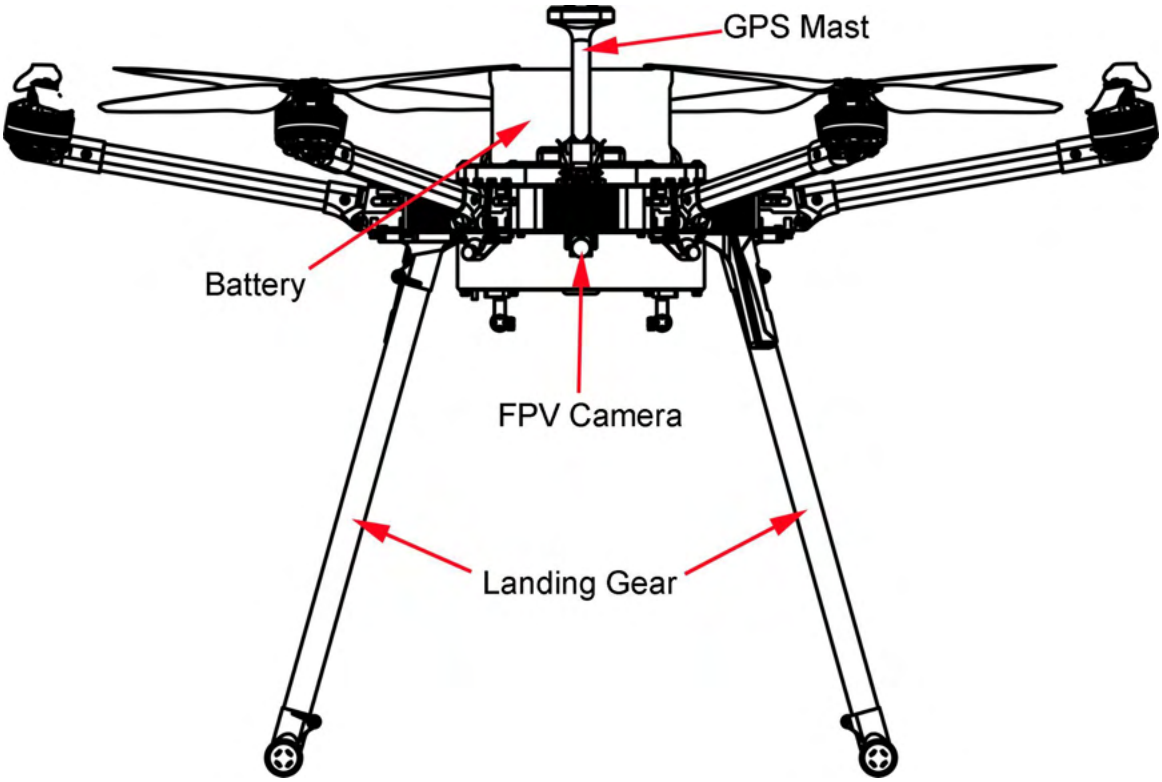


Figure 2. Front View of the IF1200 Aircraft

3. Hand Controllers

The IF1200 includes one of the hand controllers shown below. Click on the link to go to the page for that hand controller.

NOTE: The HereLink Blue and HereLink Black both have QGroundControl software installed at the factory.

	HereLink Blue (Union Robotics) QGroundControl installed Using HereLink Hand Controllers
	HereLink Black (CubePilot HereLink HD video transmission system) QGroundControl installed Using HereLink Hand Controllers
	IF1200 Long Range Telemetry (LRT) Uses a Jeti DS-12 hand controller (shown at left), and RFD900x-US long range telemetry radio QGroundControl installed Long Range Telemetry (LRT)

4. HereLink Blue Hand Controller

This configuration uses the HereLink Blue hand controller, made by Union Robotics. The User Guide for this hand controller can be found online at:
https://docs.union-robotics.com/manuals/blue-herelink-overview
The HereLink Blue GCS has an internal battery which can be charged via a micro USB port on the bottom of the unit.

The HereLink Blue hand controller has QGroundControl software installed at the factory.

Note: The HereLink hand controller can be used while it is being charged.

Figure 3. HereLink Blue Hand Controller

5. HereLink Black Hand Controller

This IF1200 version uses the HereLink Black hand controller, made by CubePilot. The HereLink Black User Guide can be found online at:
https://www.cubepilot.com/#/herelink/features

Note: The HereLink hand controller can be used while it is being charged.

Figure 4. HereLink Black Hand Controller

6. Long Range Telemetry (LRT)

Description

The LRT kit includes:

- IF1200 aircraft
- Jeti DS-12 hand controller
- RFD900x-US telemetry radio

Customer-supplied:

- Laptop or tablet, with QGroundControl installed. The RFD900x-US telemetry radio plugs into a USB port on this device.

The RFD900x-US telemetry connects to a USB port on the laptop or tablet.
The device, (laptop or tablet), operates as a ground control station. QGroundControl (QGC) software must be installed on the device before flying. QGC is an open-source mission planning software for aircraft running PX4, and is extremely well documented. You are encouraged to review the user guide at: https://docs.qgroundcontrol.com/en/.

Figure 5. Long Range Telemetry Configuration

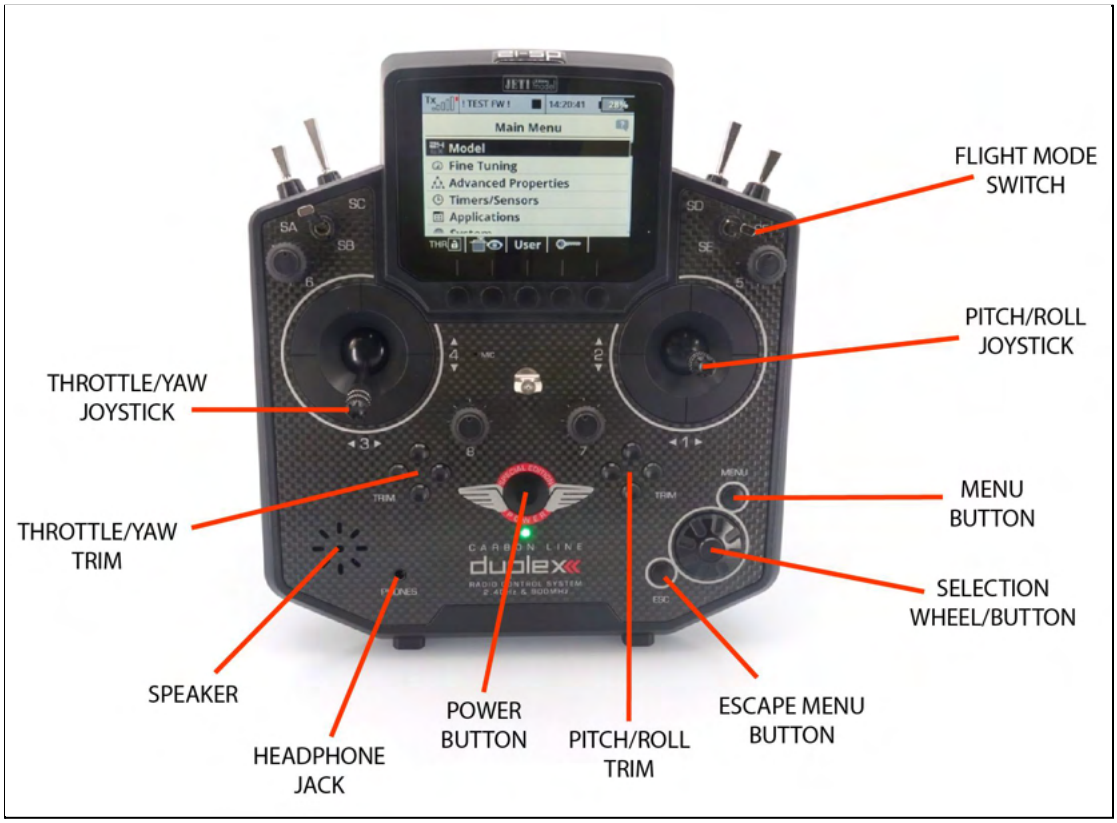


Figure 6. Jeti DS-12 Hand Control

7. Battery Charging

The IF1200 kit uses a Tattu TA1200 battery charger (see below) for charging the flight batteries. The Tattu charger can charge two batteries simultaneously. Looking at the top of the charger, you can see that both sides of the charger have the same controls, outputs, and displays.

NOTE	Please read the Tattu TA1200 Product Manual thoroughly before using the charger.

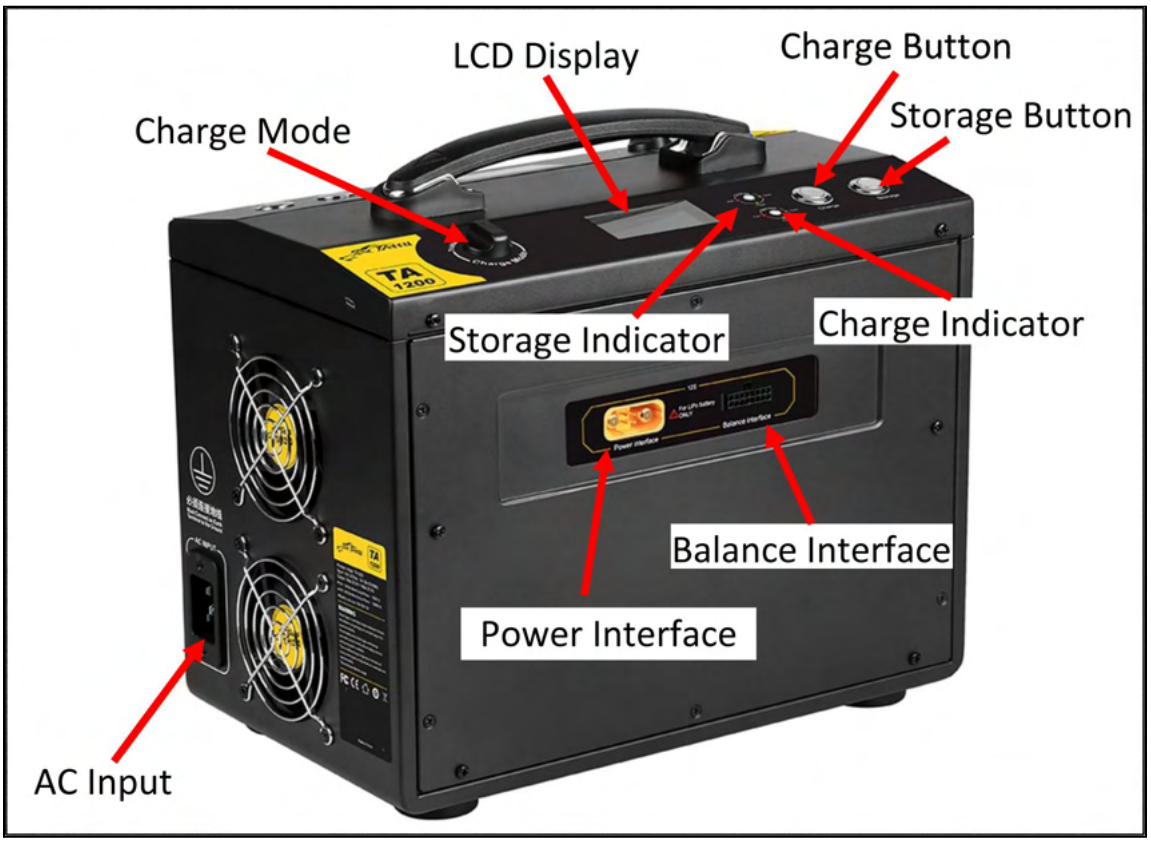


Figure 7. Tattu TA1200 Battery Charger

Charge the Flight Batteries

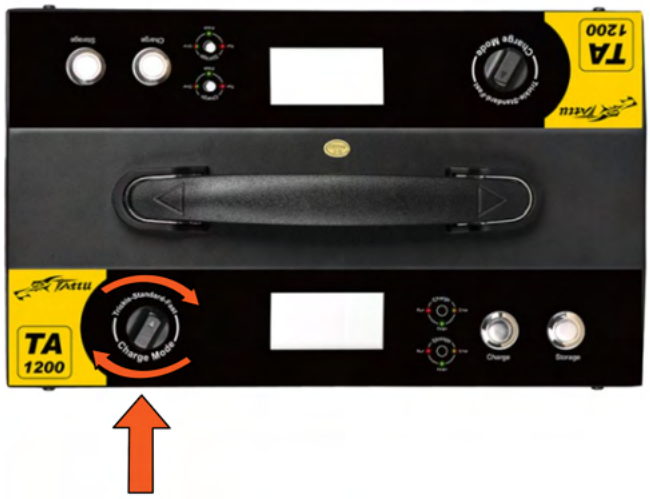
⚠	**IMPORTANT! Read the accompanying charger manual thoroughly before connecting power and batteries to the charger. It contains important safety information.**

NOTE	**Balancing cells:** The flight batteries used in the IF1200 contain multiple cells. Differences in the voltages between cells can degrade the performance of the batteries, and shorten its life. The Tattu battery charger has a function for balancing the voltages of the cells. Read the included manual to implement this function.

Step	Action
Note: This procedure describes how to set up a single battery for charging. The Tattu charger can charge two fly batteries simultaneously.	
1	Connect the included AC power cable into the AC input connector on the charger.
2	Connect the other end of the AC power cable to a power source (100V–240 VAC).
3	Press the power button on the side of the battery charger (see below) to power on the unit. Fans begin spinning, and the LCD displays on top of the charger illuminate.
	

Continued next page

Charge the Flight Batteries, Continued

Step	Action
4	Rotate the Charge Mode dial (see below) to select the charge mode. There are three charging modes: ● Trickle: The slowest charging rate. Use Trickle mode when possible to extend the battery life. ● Standard: A compromise between Trickle and Fast ● Fast: Typically used in the field **Note:** Faster charging rates shorten the battery's lifespan.
	
	Continued next page

Charge the Flight Battery, Continued

Step	Action
5	Uncap the battery cable and plug it into the Power Interface port on the charger (see below). **Note**: The battery cable and Power Interface port on the charger are designed to prevent incorrect mating of the two.
	
6	Once connected, the battery goes through a precharge countdown for 10 seconds, then begins charging automatically. **Note:** To skip the precharge countdown, hold the ‘Charge’ button for 2 seconds.
7	Cell voltages and battery levels are displayed on the LCD screen. When the battery is fully charged, each cell voltage should be about 4.20 Volts, and the charger will display ‘Fully Charged’.
NOTE	If you can’t wait for the battery to fully charge, power off the charger by pressing the ‘On/Off’ button BEFORE unplugging the battery to avoid an error message being displayed on the LCD.
WARNING	**DO NOT disconnect the battery cable from the charger while the flight batteries are charging. Doing so may result in electrical arcing, causing severe burns to the operator.**
End of Procedure	

Balancing the Battery's Cells

The flight battery used with the IF1200 are composed of individual cells. During the life of a battery, individual cells voltages may differ from each other, which shortens the lifespan of the battery. The cells' voltages must be 'balanced' so that all of the cells' voltages are within the same voltage range.

When the battery is connected to the charger, individual cell voltages are displayed on the LCD screen.

NOTE	It is recommended to balance a battery's cells once every 10 charge cycles, or whenever the red triangular LEDs on the battery are illuminated.

The following procedure describes how to balance the cells in a battery.

Balance a Battery's Cells	
Step	**Action**
1	Power on the battery charger.
2	Locate the Balance Cable in the aircraft kit.
3	Connect one end of the Balance Cable to the Balance Interface on the charger (see Figure 7), and the other end to the Balance port on the battery.
4	Perform the battery charging procedure described in the previous section.
End of Procedure	

Storage Mode

If a battery will be shipped or will not be used for long periods of time, it is highly recommended that the battery be placed into storage mode. Depending on the battery's state of charge, putting the battery into storage mode will either charge or discharge the battery to a voltage that is most stable for shipping and sitting for long periods of time.

To place a battery into storage mode, plug the battery's power cable into the charger and hold the Storage button for 5 seconds. The charger will beep, the fans will spin up, and the LCD display will indicate that storage mode has begun.

Troubleshooting Battery Charging

Error message appears on the screen:

- Unplug the battery and press the ‘Charge’ button to reset the interface.

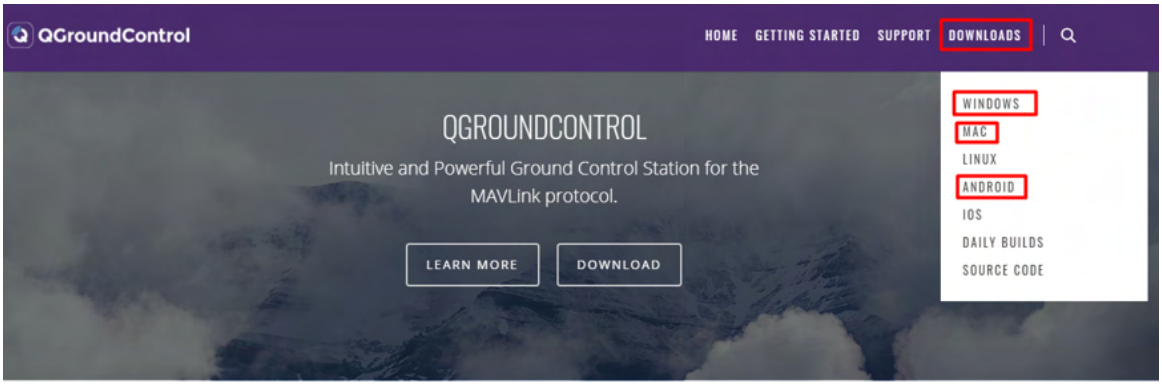
Popping or arcing when plugging the battery into the charger:

- The battery likely needs to be balanced. Plug in the balance cable to both the charger and battery, then plug the main lead of the battery into the charger to conduct a balance charge.

8. Install QGroundControl

QGroundControl (QGC) is an open-source mission planning and configuration software for aircraft using the MAVLink Communication Protocol. QGC is extremely well documented and we encourage all first-time users to review the available user guide at: https://docs.qgroundcontrol.com/en/. Training videos describing all aspects of planning and uploading an autonomous mission are available online.

The following procedure describes how to install QGC onto a laptop or tablet.

Install QGC onto a Device	
Step	**Action**
1	Download the QGroundControl installer from http://qgroundcontrol.com/. The download links for PC, Mac or Android tablets can be found on the top right 'Downloads' drop-down menu of the website (see below).
2	Follow the prompts on the website to download and install QGC to your device.
	
3	To establish a link between the aircraft and QGC, power on the ground station (and open QGC) BEFORE you power on the aircraft. QGC automatically connects to the aircraft when it powers up.
End of Procedure	

9. Assemble the Aircraft

Step	Action
1	Remove the aircraft from its shipping container and gently set aside. The landing gear are located in the two horizontal cavities under the aircraft.
2	The aircraft has two landing gear, each made of a horizontal tube, and a vertical tube (see figure 8 below).
3	On one of the horizontal tubes (with the rubber feet), loosen the clamp.
4	Insert a vertical tube into the horizontal tube so that the rubber O-rings are on the lower half, toward the horizontal tube. **Note:** There is a notch in the end of each vertical tube (see Figure 9 on the next page). Insert the vertical tube so that the notch aligns with the inner features of the horizontal tube, so that the vertical tube is fully seated in the horizontal tube.
Continued next page	

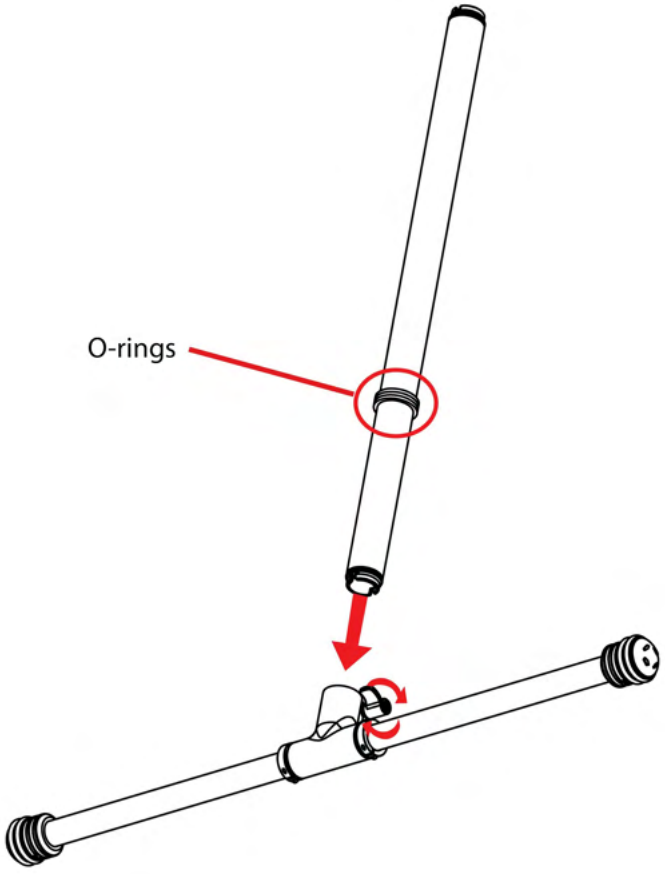


Figure 8. IF1200 Landing Gear Assembly

Step	Action
5	The ratcheting arm can be pulled away from the screw to move the arm to a more convenient location when tightening. Tighten the clamp.
6	Repeat steps 3 through 5 to assemble the second landing gear.
Continued next page	

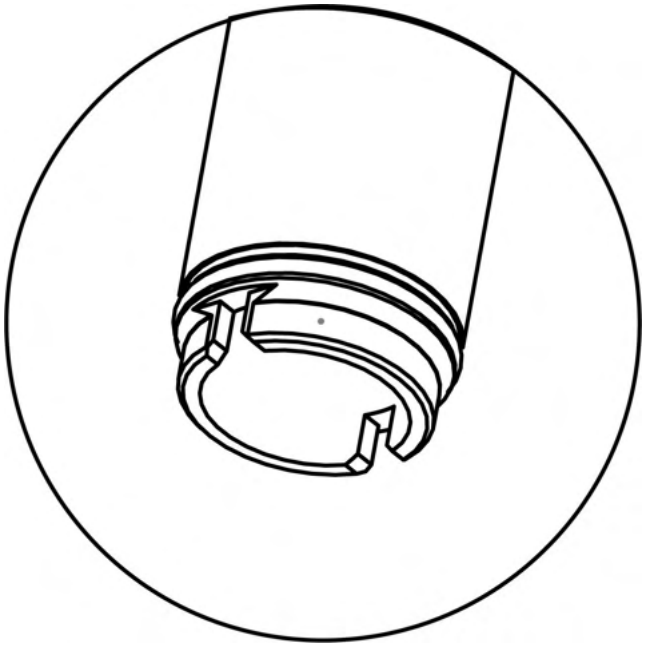


Figure 9. Alignment Notch in the end of the Vertical Tube

Step	Action
7	Lift the GPS mast into the upright position, latching the clips on both sides of the mast (see below).
Continued next page	

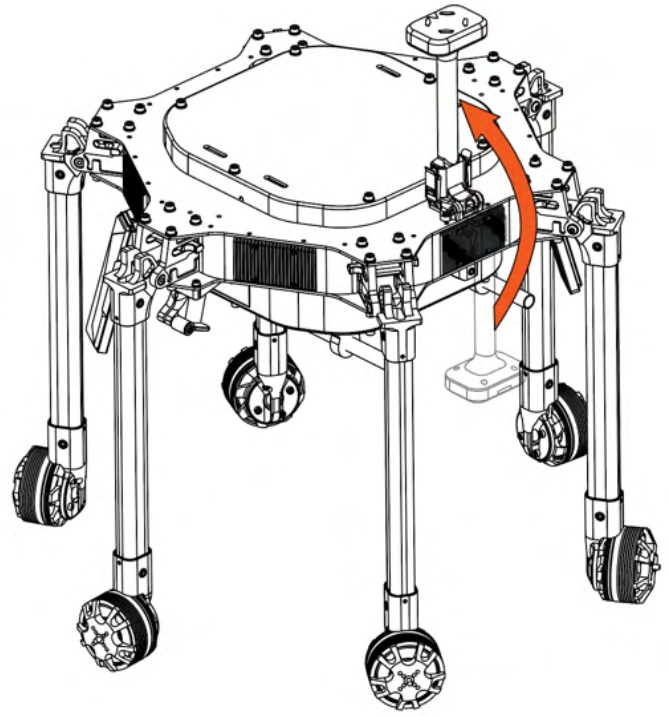


Figure 10. Lock the GPS Mast in Place

Step	Action
8	Unfold the two aircraft arms that are over the landing gear sockets into their extended position. The arms will lock securely into place (see below).
Continued next page	

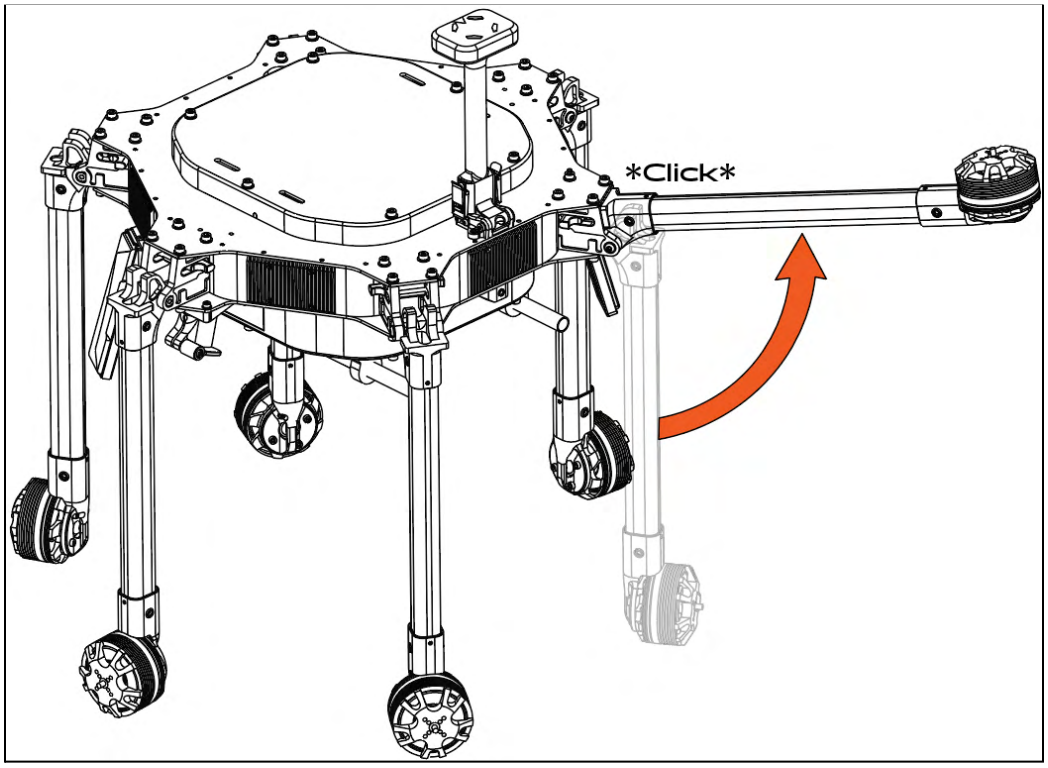


Figure 11. Lock the Arms into Place

Step	Action
9	Insert the landing gear legs into the corresponding sockets on the underside of the aircraft. Ensure the notch at the end of the tube is aligned with the corresponding key inside the socket.
NOTE	Ensure the vertical tube is fully inserted before tightening the ratcheting clamp. The ratcheting arm can be pulled away from the screw to move the arm to a more convenient location when tightening. Tighten the clamp until snug, then rotate a quarter turn further.
10	Unfold the remaining arms and lock them into place.
End of Procedure	

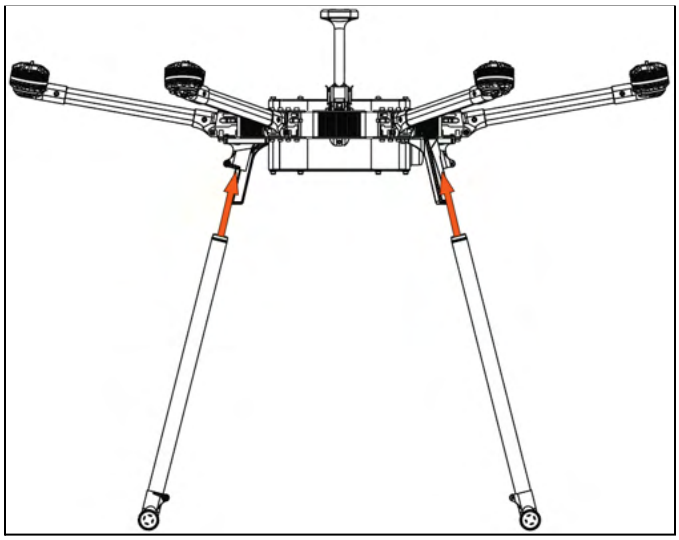


Figure 12. Attach Landing Gear to Body

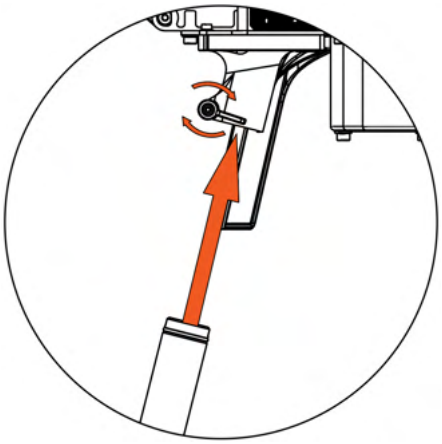
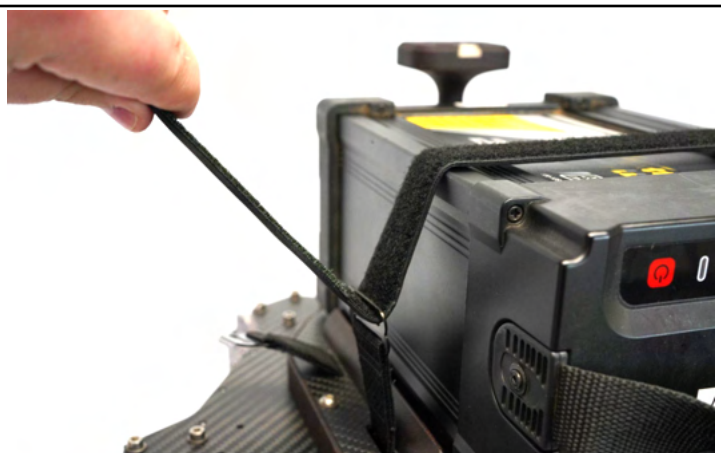


Figure 13. Landing Gear Clamp

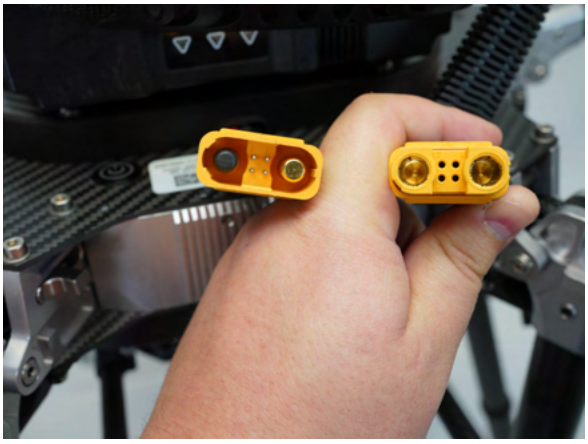
Install the Flight Battery in the Aircraft

Step	Action
1	Ensure the velcro straps on top of the aircraft are unfastened and moved out of the way so that the battery can be placed on top of the aircraft.
	
2	Lay the battery on the rubber alignment pads on the top plate of the aircraft, ensuring the battery is oriented such that the battery's indicator lights are towards the top of the battery, and the battery cable is towards the rear of the aircraft.
	
	Continued next page

Install the Flight Battery in the Aircraft, Continued

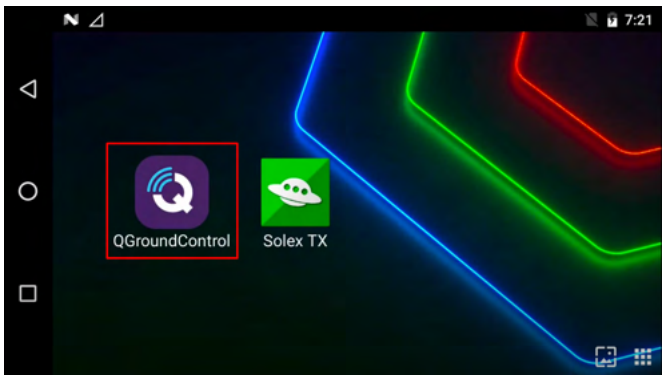
Step	Action
3	Locate the battery straps and loop the ends through the metal loops on the opposite side.
	
4	Pull the straps tightly over the battery.
	
	Continued next page

Install the Flight Battery in the Aircraft, Continued

Step	Action
5	Secure the velcro strap tightly to itself close to the body of the aircraft.
	 
6	Plug in the male battery connector on the battery cable into the female battery connector on the aircraft (see below). **Note:** The mating connectors are designed to prevent incorrect connection.
	 
CAUTION	**Ensure the connectors are fully mated. Failure to do so could lead to arcing inside the connector, damaging it.**
End of Procedure	

10. Using HereLink Hand Controllers

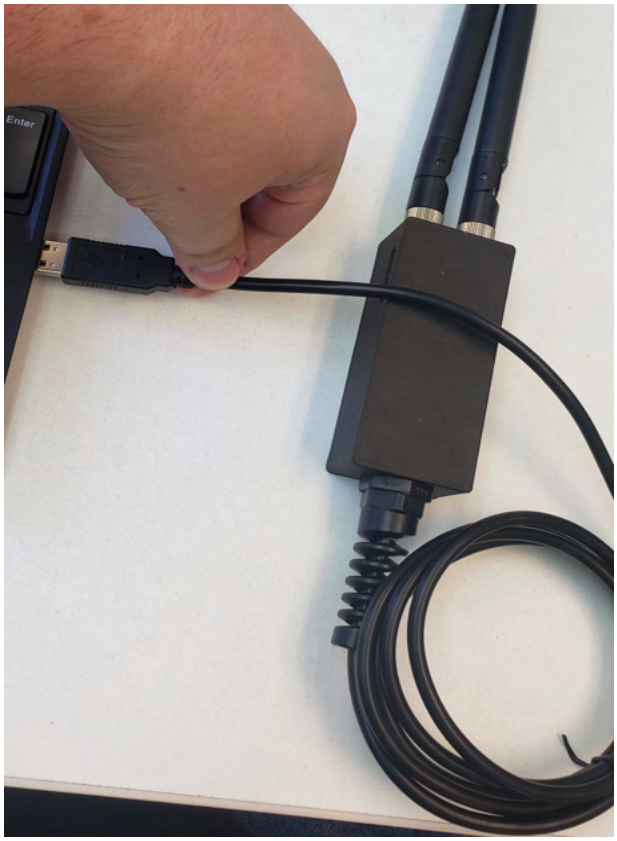
Both the HereLink Blue and HereLink Black hand controllers have QGroundControl (QGC) software installed at the factory. QGC is extremely well documented and we encourage all first-time users to review the available user guide at: https://docs.qgroundcontrol.com/en/. Training videos describing all aspects of planning and uploading an autonomous mission are available online.

Step	Action
1	Install the antennas on the top of the hand controller.
2	Press and hold the power button on the hand controller. Two applications appear on the hand controller's screen (see below). Select QGroundControl (QGC).
	
3	Two icons appear in the toolbar in the upper-left corner of the QGroundControl screen (see below). The Fly icon is highlighted. Next to it is the Plan icon. Tap on either icon to switch between the two screens. **Note**: When QGroundControl is first opened, it defaults to Fly mode, which displays a connected camera's video stream and map.
	
Plan	Use this screen to plan and upload autonomous missions to the aircraft. Waypoints can be added and configured to plan a mission. Tools are available to create various patterns such as surveys and corridor scans. A mission command list appears on the right-hand side of the screen where you can change waypoints and planned actions.
Fly	Monitors the aircraft during operation, providing telemetry readouts and an overlay of any video streaming. You can toggle between a map view of the aircraft's current flight, or a video stream if the aircraft is equipped with that capability. All in-flight actions, emergency and otherwise, can be accessed through the Fly view.
Note: QGC can be accessed on the HereLink or on a laptop receiving a Wi-Fi signal from the HereLink.	
Continued next page	

Step	Action
4	**GPS satellite count and status:** This is indicated in the toolbar at the top of the QGroundControl screen (see below). The top number is the satellite count, the bottom number is the HDOP (horizontal dilution of precision).
NOTE	To assure a GPS lock, the aircraft must be connected to a minimum of 10 satellites before flying.
	
End of Procedure	

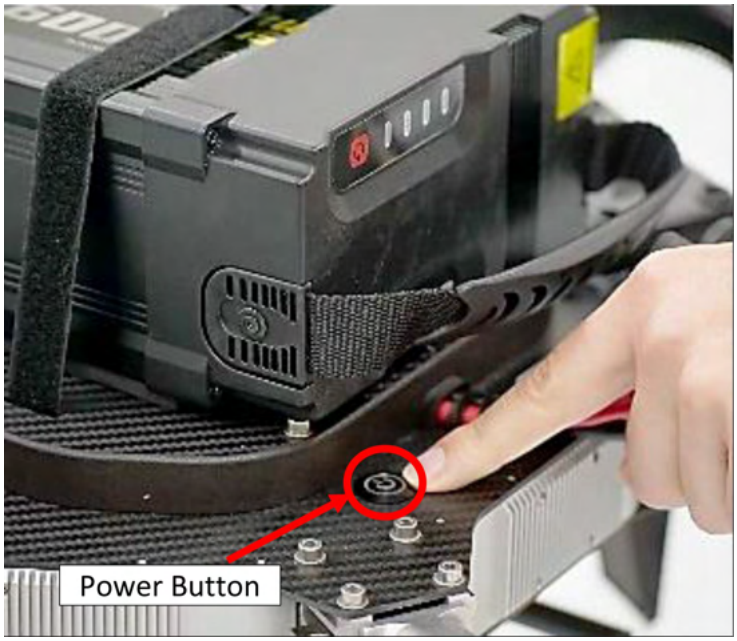
11. Set Up the Long Range Telemetry (LRT) Radio

Note: The IF1200 LRT can be flown in Position or Return to Launch modes using only the Jeti DS-12 transmitter. For Altitude mode and autonomous missions that require location information (GNSS) and aircraft information, a ground station (laptop or tablet) with the RFD900x-US connected to it and QGC installed is required.

Step	Action
NOTE: Before performing this procedure, QGroundControl must be installed on the device (laptop or tablet) that will be used as the ground control station.	
1	Plug the Long Range Telemetry (LRT) into an open USB port on the ground control station (see below).
	
Continued next page	

Step	Action
2	Turn on the Jeti DS-12 by pressing the Power button for two seconds (see below).
	
3	When the screen activates, it prompts you with, “Start Transmitter?” Press the button “Yes” (see below).
	
End of Procedure	

12. Power On the Aircraft

Step	Action
1	Press and hold the power button on the chassis at the rear of the aircraft (see below) until the button illuminates green. The LED indicators turn on after about 7 seconds.
	
2	The aircraft will emit a series of beeps during the initialization sequence. The GPS status indicator (on top of the GPS Mast) behaves as follows: • **Blue flashing**: Waiting for GPS lock • **Green flashing**: GPS Lock obtained, ready to fly. • **Red flashing**: Error - See QGroundControl for error message details, or reboot aircraft.
3	**Navigation LEDs**: There are navigation LEDs on the end of all six arms on the aircraft, just below each motor. These become active as follows: • Front-left: Red (port) • Front-right: Green (starboard) • Rear: a white LED, on each (2) rear motor
End of Procedure	

13. Flight Modes

Flight Mode Descriptions

Flight Mode Descriptions	
Mode	**Description**
Altitude	The aircraft maintains altitude, but its horizontal position is controlled by the pilot.  **Caution**: Altitude flight mode maintains vertical position. Horizontal drift will occur. The autopilot will automatically switch to this mode when GPS is unreliable. The aircraft defaults to Altitude flight mode if the aircraft takes off before a GPS lock is obtained. Switch to Position mode when possible.
Position	The aircraft maintains its position, heading, and altitude using GPS. The roll, pitch, and yaw are controlled by the pilot as in Altitude mode, but when the sticks are neutral the aircraft will slow to a stop and maintain its current altitude and position. This mode is recommended for basic flying (and first flight).
Return to Launch (RTL)	This mode is recommended for normal landings and for landing after an autonomous mission. When activated, the aircraft automatically returns to its Launch position and lands. The Launch position is the original takeoff location of the aircraft. If the aircraft is below an altitude of 30 meters, it first rises to 30 meters before returning to its Launch position in a straight line. Upon reaching its destination, the aircraft slowly descends until it lands. This altitude of 30 meters can be adjusted in the 'Safety' tab within QGroundControl.
NOTE	If the aircraft behaves unexpectedly while flying autonomously, switch to Position mode to regain control. Moving a joystick during an autonomous mission reverts control back to the pilot.
	The IF1200 automatically returns to the launch site as a failsafe when the battery voltage gets too low to continue flight; visually monitor the battery level in QGC and replace the battery conservatively to mitigate risk.

Selecting Flight Modes on the Hand Controllers

This section describes the location and function of the flight mode controls on the hand controllers. See Figure 12 and Figure 13 below for control locations.

Flight Mode Controls		
Control	**Flight Mode**	**Location on Hand Controller**
	**Position**	**HereLink:** Button on bottom of the front panel (see Figure 12). **Jeti DS-12:** Top and mid-position of three-way switch on upper-right of front panel (see Figure 13).
	**Return to Launch**	**HereLink:** Button on bottom of the front panel (see Figure 12). **Jeti DS-12**: Bottom position of three-way switch on upper-right of front panel (see Figure 13).

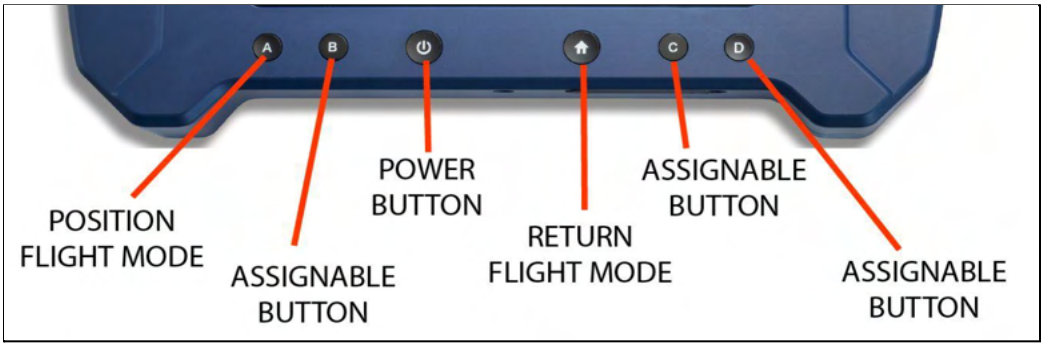


Figure 12. Flight Mode Buttons on HereLink Hand Controller

Figure 13. Flight Mode Switch on Jeti DS-12.

Continued next page

Jet DS-12: When the Mode Switch on the Jeti DS-12 is used to switch flight modes, the QGroundControl display on the ground control station updates to show the new flight mode.

HereLink: The current flight mode is indicated in the top right corner of the QGC display (see Figure 14 below). **Altitude** mode (see below) will be the default mode until the aircraft has been outside long enough to obtain a GPS lock.

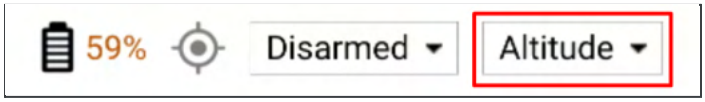


Figure 14. Altitude Mode Shown

14. Arm and Disarm

- **Arm** means to start the propellers spinning.
- **Disarm** means to stop the propellers from spinning.

Step	Action
Arming	
1	Verify each item on the Preflight Checklist (see the end of this User Manual).
2	**Arm** the aircraft by bringing the left joystick stick down and towards the center of the hand controller (see below). The motors start spinning in an idle state. **Note:** a Jeti DS-12 is shown below. These instructions also apply to the HereLink hand controllers.
	
Disarming	
1	**Position Mode:** Once the aircraft has landed, hold the throttle down and to the left. The propellers stop spinning. **Autonomous Mode**: The aircraft automatically disarms upon landing.
End of Procedure	

15. Takeoff and Landing

Step	Action
Takeoff	
1	Verify each item on the Preflight Checklist (see the end of this User Manual).
2	Takeoff by slowly raising the throttle (left joystick). The throttle must be raised above the midpoint. Continue raising the throttle and the aircraft will take off.
CAUTION	If the aircraft begins to tip over on takeoff, immediately lower the throttle and disarm. This usually occurs due to a propeller being installed on the wrong motor.
Landing in Position Mode	
1	Be sure the landing site is level and clear of obstructions. • If the takeoff and landing locations are the same, the aircraft slows itself before landing. • If the aircraft is landing at a location where the elevation is different from takeoff, reduce throttle on landing.
2	Lower the throttle completely until the aircraft has landed.
Landing in Return to Launch Mode	
1	The ‘Launch’ location is automatically set before takeoff, therefore select a Launch location that is level and clear of obstructions for landing. The aircraft will autonomously return to the takeoff location and slowly descend.
2	If it becomes dangerous to land in the Launch position, move the joysticks at any time to regain control of the aircraft. You can also switch the hand controller back to ‘Position’ mode. The aircraft will hover in place until the pilot lands the aircraft as described in the previous paragraph.
End of Procedure	

16. Power Off the Aircraft

Step	Action
1	Power down any Sony camera attached to the aircraft.
2	Press the power button on the IF1200 (see below) to power off the aircraft
	
3	Disconnect the battery (pull on the connector, not the wires).
4	Power down the hand controller by holding the Power button in, then follow the on-screen prompts.
End of Procedure	

17. Planning a Mission

This section presents the basics of setting up an autonomous mission in QGC and then describes in detail how to create an example mission.

Once you are comfortable flying the aircraft, learning how to plan an autonomous mission greatly expands the applications of the aircraft. The information in this section is taken from the QGroundControl website, and the website should be referenced if you have any questions. QGroundControl documentation has detailed information about planning an autonomous mission at the following link:
https://docs.qgroundcontrol.com/master/en/PlanView/PlanView.html

WARNING	If the aircraft starts behaving unexpectedly, dangerously or abnormally during a mission, switch to Position mode to regain control.

GUI for Planning a Mission in QGC

The figure below is a screenshot of a mission plan in QGroundControl. The mission starts with a takeoff at the Planned Home position (H), flies through three waypoints, then lands on the last waypoint (waypoint 3).

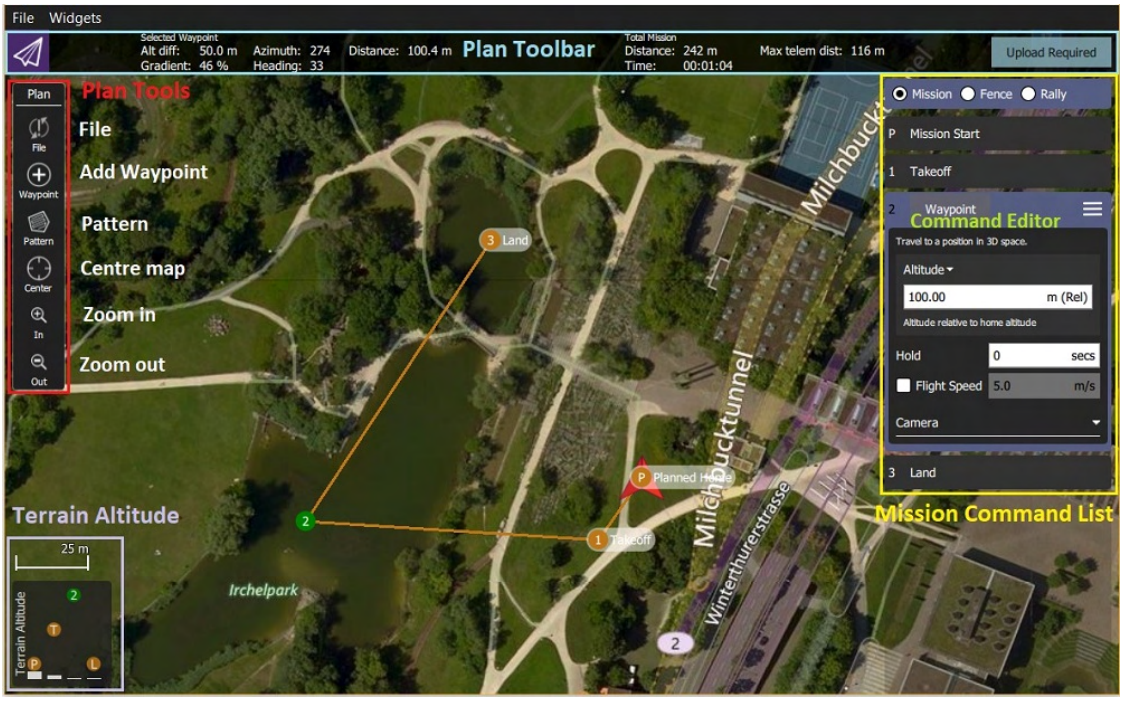


Figure 17. QGroundControl Screenshot of Mission Plan

QGroundControl User Interface Overview

The main elements of the User Interface (UI) for planning a mission are described below (see Figure 17 on the previous page)

- **Map (main area of display)**: Displays the numbered indicators for the current mission, including the Planned Home. Click on the indicators to select them for editing, or drag them around to reposition them.
- **Plan Toolbar (top of display)**: Status information for the currently selected waypoint relative to the previous waypoint, as well as statistics for the entire mission (e.g. horizontal distance and time for mission).
    - `Max telem dist`: the distance between the Planned Home and the furthest waypoint.
    - When connected to a aircraft, an Upload button is shown,and can be used to upload the plan to the aircraft.
- **Plan Tools (left side of display)**: Used to create and manage missions.
- **Mission Command List Overlay (right side of display)**: Displays the current list of mission items (select items to edit).
- **Terrain Altitude Overlay (lower left corner of display)**: Shows the relative altitude of each mission command.

It shows you information related to the currently selected waypoint as well as statistics for the entire mission.

Example Mission

The basic steps for planning and executing a mission are:

1. In QGroundControl, change to Plan view.
2. Set Home position
3. Add waypoints
4. Set landing point
5. Upload the mission to the aircraft.
6. Change to Fly view and execute the mission.

The following procedure describes how to plan a basic mission. There are different methods for planning a mission; the basic procedure described below illustrates some of the tools used for planning a mission.

Please refer to the online QGC documentation for more details regarding planning a mission: https://docs.qgroundcontrol.com/master/en/PlanView/PlanView.html

Note 1: in the following procedure, “select” means to tap (if using a touch screen), or mouse click (if using a mouse).

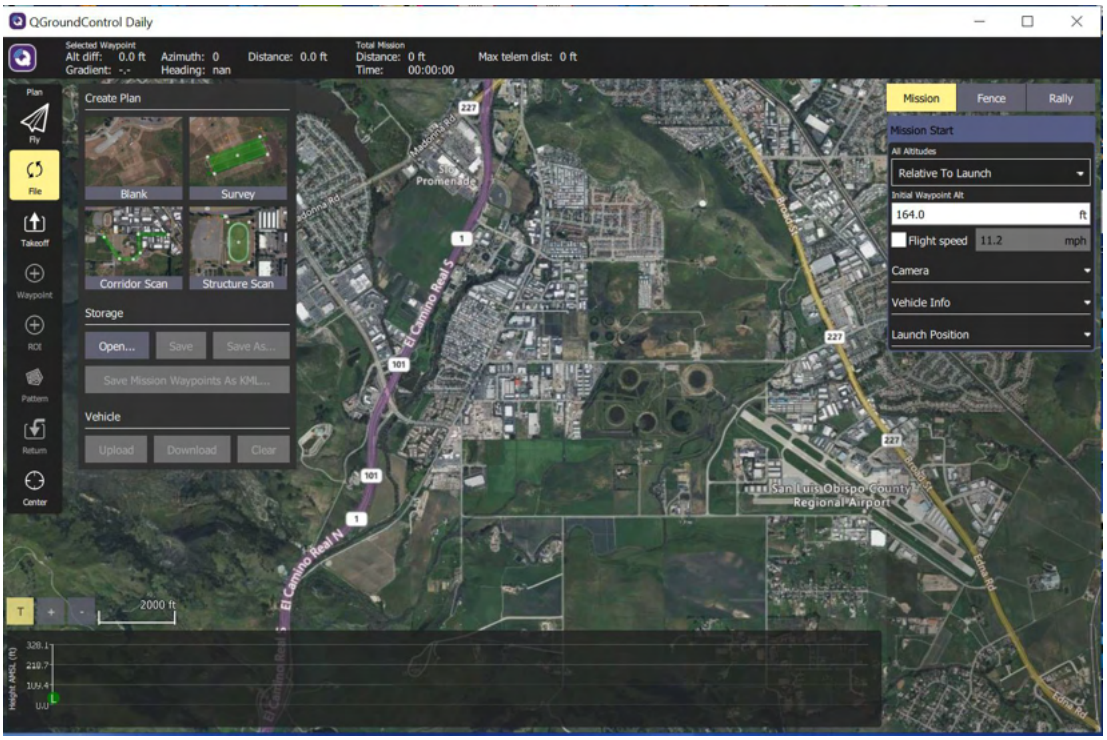
Note 2: QGC does not need to be connected to the aircraft to plan a mission. However, QGC must be connected to the aircraft to upload the mission.

Note 3: The following procedure is based on QuickGroundControl version 4.1.6.

Step	Action
1	Open QGroundControl on the ground station.
2	On the Toolbar (upper-left of display), switch to Plan mode (see screenshot below).
	
3	The Plan screen opens (see next page).
Continued next page	

Example Mission, Continued

Step	Action
4	On the left side of the screen, locate the Create Plan overlay. Select (mouse click or tap screen) Blank. **Note:** Other Plan types are available. The Blank plan is chosen for illustration purposes for this example. The Blank plan screen is displayed (see below). **Map navigation:** You can drag the Map to bring a specific geographical area into view. You can also zoom in and out of the Map view by selecting the + and - icons in the lower-left corner of the screen.



Continued next page

Example Mission, Continued

Step	Action
5	On the Plan Tools panel on the left side of the screen, select the Takeoff button (#1 below). The Takeoff icon appears (# 2 in the screenshot below). **Note:** A Takeoff panel appears in the Mission Command List on the right side of the screen when the Takeoff icon is selected. The trashcan in the Takeoff panel allows you to delete a Takeoff point if you need to redo the takeoff point.
6	Drag the Takeoff icon and release it at the desired location on the map.
Continued next page	

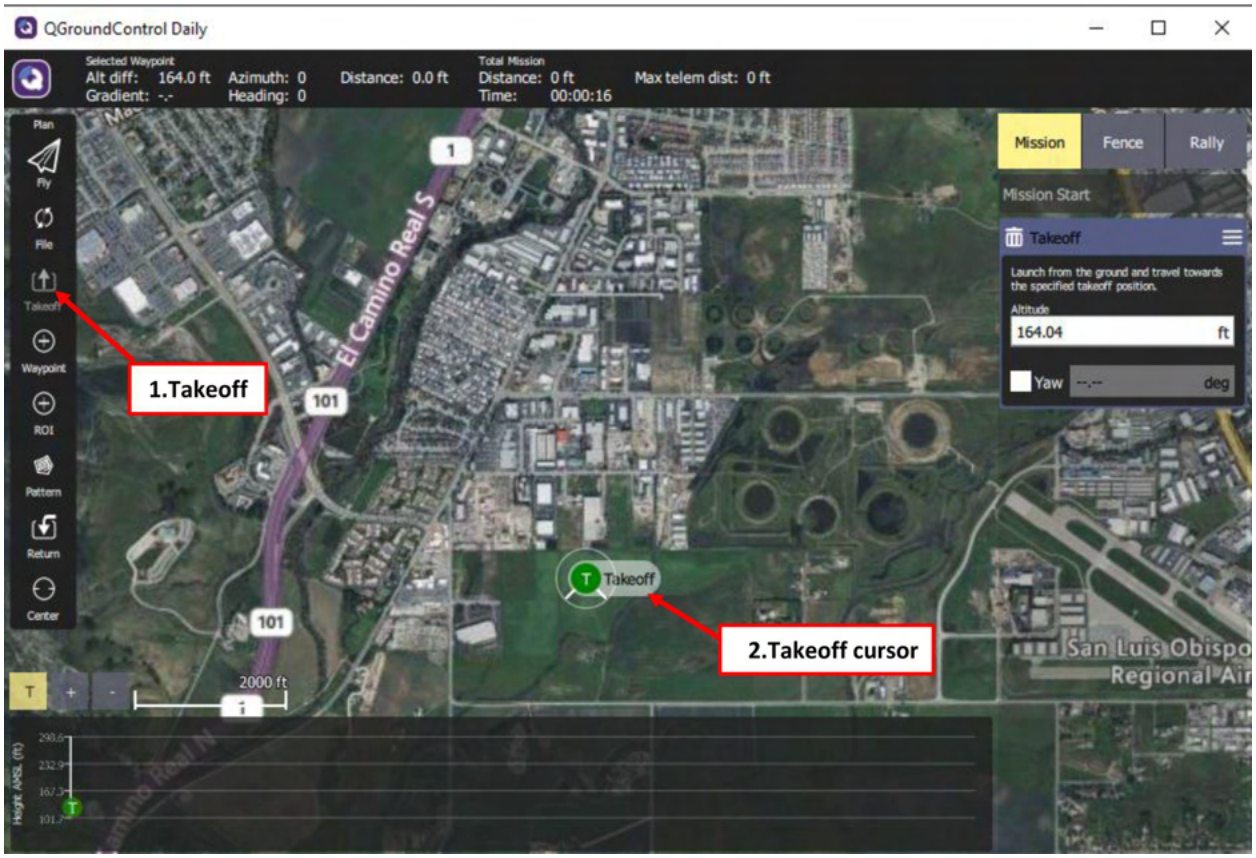


Figure 18. Selecting a Takeoff Point

Example Mission, Continued

Step	Action
7	Place the first Waypoint: 1. In the Plan Tools, select Waypoint (#1 below). 2. Place the cursor on the map for the desired Waypoint location (#2 below), then select it 3. Notice that the Waypoint panel appears on the right side of the screen when Waypoint was selected in the Plan Tools panel.
8	Use the steps described in the previous step to add more waypoints as desired. **Note:** Waypoints may be deleted by selecting the trashcan icon at the top of the Waypoint panel.
Continued next page	

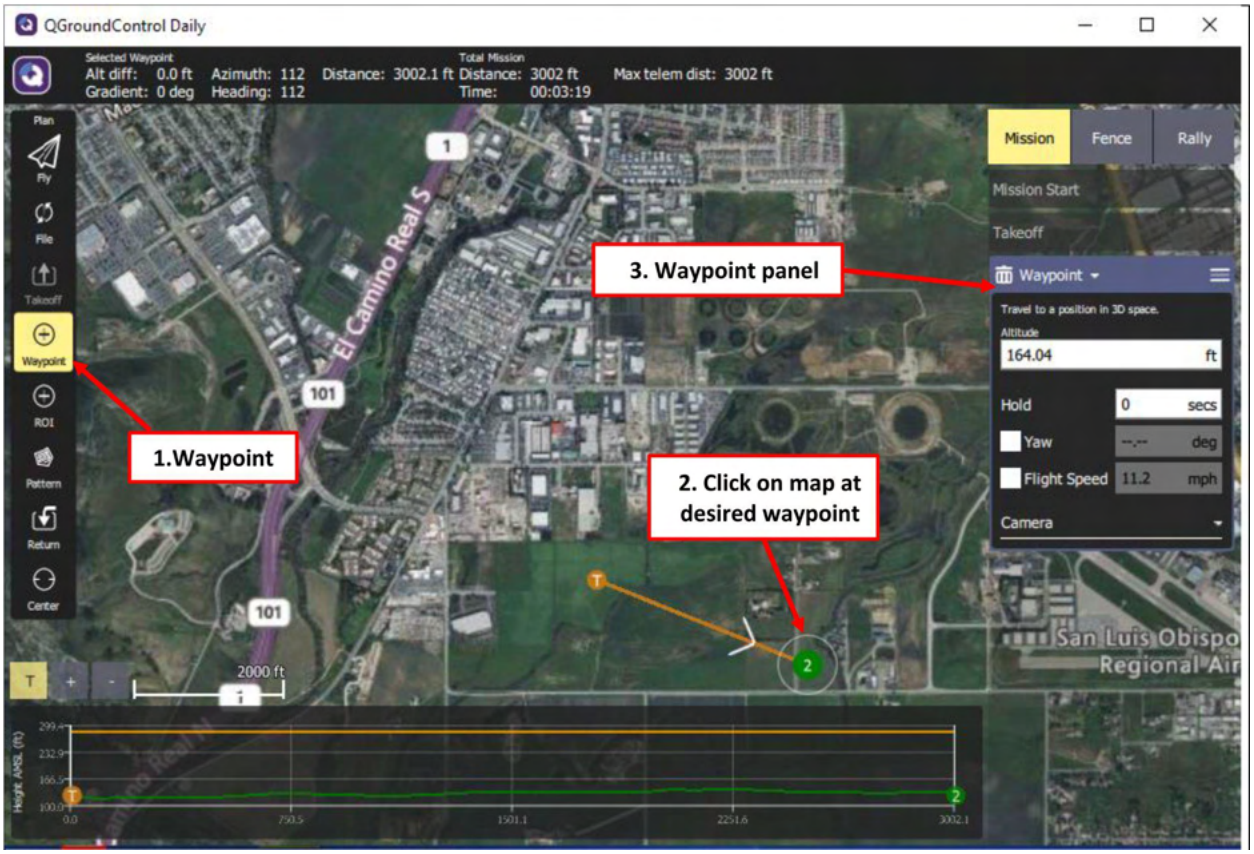


Figure 19. Adding Waypoints

Example Mission, Continued

Step	Action
9	After you've added the desired Waypoints, complete the mission plan by creating a Return to Launch point. In the Plan Tools panel, select the Return icon (#1 below).
10	When you select Return, the default is Return to Launch (RTL), as shown in the Mission Command List. The last leg of the mission (#2 below) is shown on the map. **Note:** For more Return and other options, click on the down arrow next to *Return to Launch* (#3 below). This opens the *Basic Mission Command Editor* (see next page).
Continued next page	

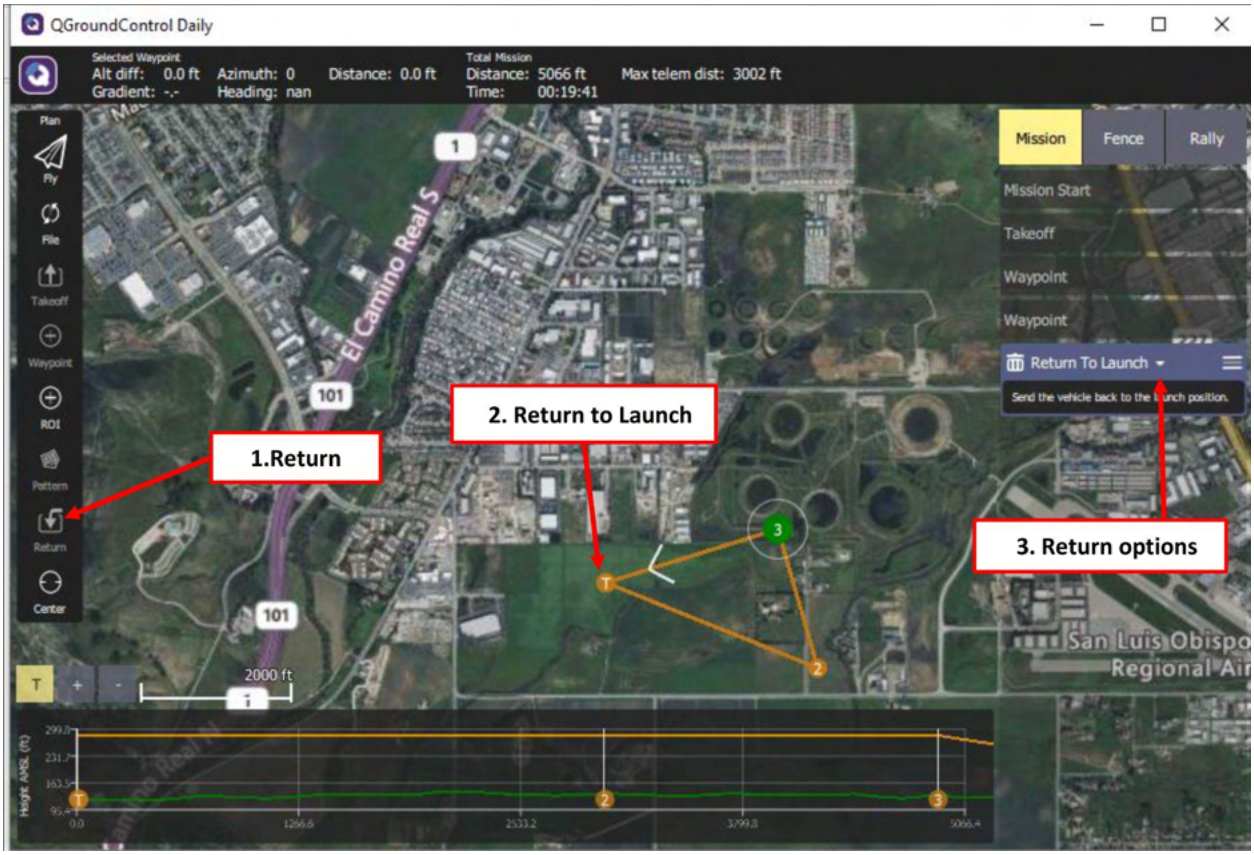


Figure 20. Add a Return

Example Mission, Continued

Step	Action
11	The Basic Mission Command Editor (the left image in the figure below) offers Return and other options. **Note:** If you select the down arrow next to the Basic category (see the figure below), it opens a dropdown menu (right side of the figure), that offers more Mission Command Editors.
Continued next page	

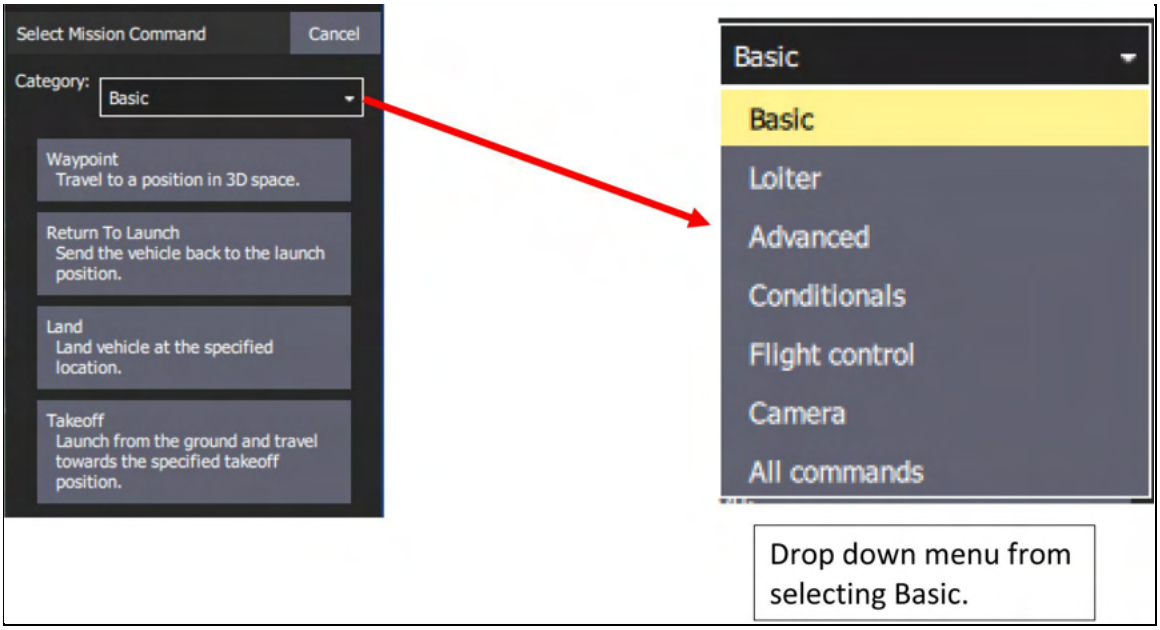


Figure 21. Basic Mission Command Editor

Example Mission, Continued

Step	Action
12	After you have finished planning a mission, you can see details of the mission in the Mission Command List, on the right side of the screen. To see details about individual events in the mission, select an event, such as a Waypoint, and details about that event appear below it (see the figure below).
13	**Note:** The mission can be uploaded to the aircraft two ways: wirelessly; or via a physical connection. The following steps describe both ways. 1. power on the aircraft 2. If you are uploading the mission wirelessly, proceed to Step 14. 3. If you are uploading the mission via a physical connection, connect a USB cable between the device supporting QGC and the USB port on the aircraft. Then go to the next step.
14	When you have completed planning the mission, an *Upload Required* icon in the upper-right corner of the screen flashes. Select it, and *Done* appears at the top of the screen if the upload was successful.
Continued next page	

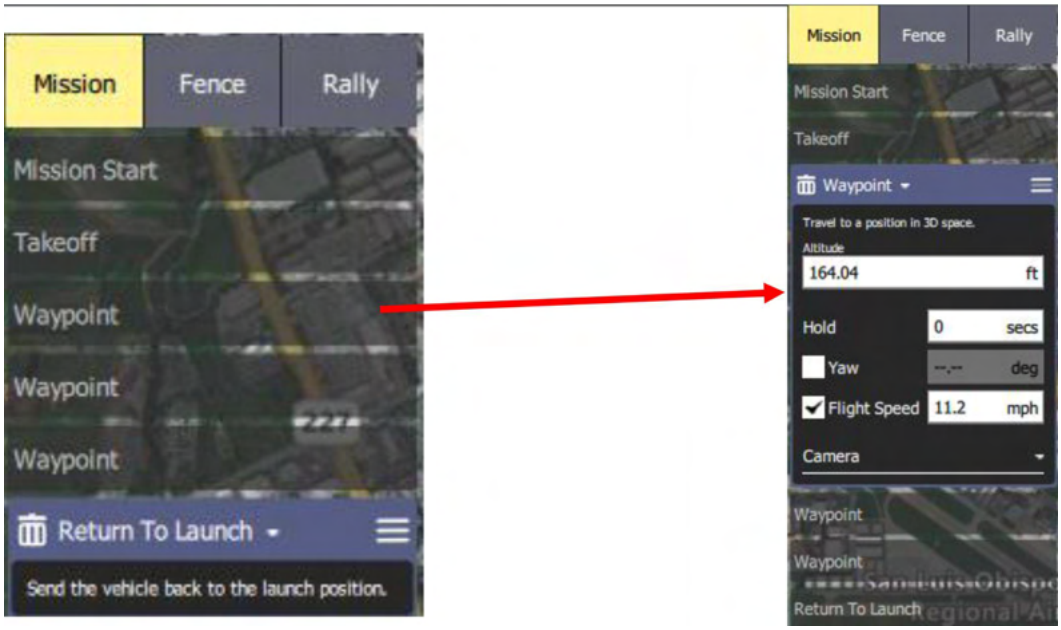


Figure 22. View Details About Mission Events

Example Mission, Continued

Step	Action
15	Select the Fly icon at the top of the Tools panel (see below).
16	A Start Mission window appears at the bottom of the QGC screen (see Figure 24 below). Slide in the Slide to confirm from left to right to takeoff.
End of Procedure	

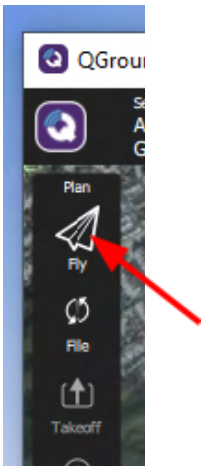


Figure 23. Fly and Takeoff

Figure 24. Start Mission Window

Preflight Checklist

- ☐ All six arms are lifted and latched in position.
- ☐ The GPS mast is lifted and latched on both sides.
- ☐ Check that the propellers rotate freely.
- ☐ The antenna(s) is (are) plugged into the top of the hand controller or telemetry radio.
- ☐ The battery is secured and plugged into the aircraft.
- ☐ The aircraft battery level shown in QGC is above 50%.
- ☐ The ground station battery is above 50% charge.
- ☐ The ground control station (laptop or tablet) is connected to the aircraft.
- ☐ The GPS indicator LED flashes green.
- ☐ At least 10 satellites are shown in QGC.
- ☐ The heading and attitude of the aircraft matches the heading and attitude shown in QGC (Rotate and tilt the aircraft with a second person to be sure).
  Note: The aircraft's compass is calibrated at the factory and typically doesn't need to be re-calibrated. Compass calibration may be necessary if significant hardware changes have been made, or if metal has been added to, or removed, from the aircraft.

  See Calibrate the Compass.
- ☐ Position flight mode is indicated in QGC.
- ☐ Launch area is secure and personnel are positioned at a safe distance from the aircraft.

Appendix

This Appendix addresses the topics listed below. Click on a topic to go to that page.

Security Risks and Mitigation

This section describes steps that can be taken to protect sensitive information in the IF750 aircraft.

Each security issue listed below is followed by one or more remedies.

Issue: Physical Access to the Aircraft

- Store the aircraft and the hand controller in a secure area accessible only by authorized personnel.

Issue: Unauthorized Access to Flight Logs

- If logs are required, transfer them from the aircraft after flight, then delete them from the aircraft.
- If logs are not required by the user, disable logging.
- Do not physically remove the SD card from the aircraft. If it is necessary to remove the SD card from the aircraft, store it in a secure area accessible only by authorized personnel.

Issue: Automated Transfer of Mission Plan to Unauthorized Client Applications

- Promptly deleting mission plans after each flight reduces the window of vulnerability.
- Missions can also be deleted during flight, while the aircraft is connected to the ground station.

Issue: Data Encryption

- Enable AES Encryption and change the Encryption keys often. Refer to the following document, available from Inspired Flight Technologies:
    - Long Range Telemetry Modem Configuration Supplement

Registering an Aircraft with the FAA

U.S. law requires that all unmanned aerial aircrafts must be registered with the FAA prior to flight.

Go to this link to register the aircraft: https://faadronezone.faa.gov/

We recommend that you print the FAA registration number and affix it to the aircraft, on the top carbon plate where the battery is mounted.

Critical Situations

Below are some situations which require immediate action.

- Battery Less than 15%: If flying with a critical battery voltage, determine the trajectory of the aircraft and fly above open ground. The aircraft is now unstable and should be brought to the ground as quickly and safely as possible. If flying in an autonomous flight mode, it is recommended to switch the control to position mode to bring the vehicle down faster.

- Loss of aircraft Control While Flying a Mission: if mission/return is behaving unexpectedly, dangerously or abnormally, switch to position mode to regain control.

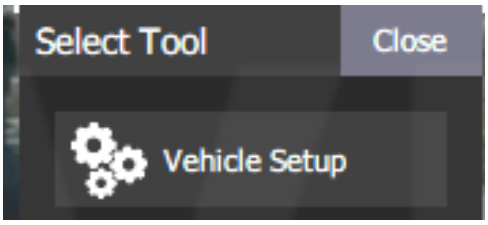
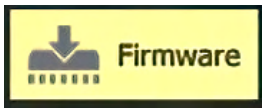
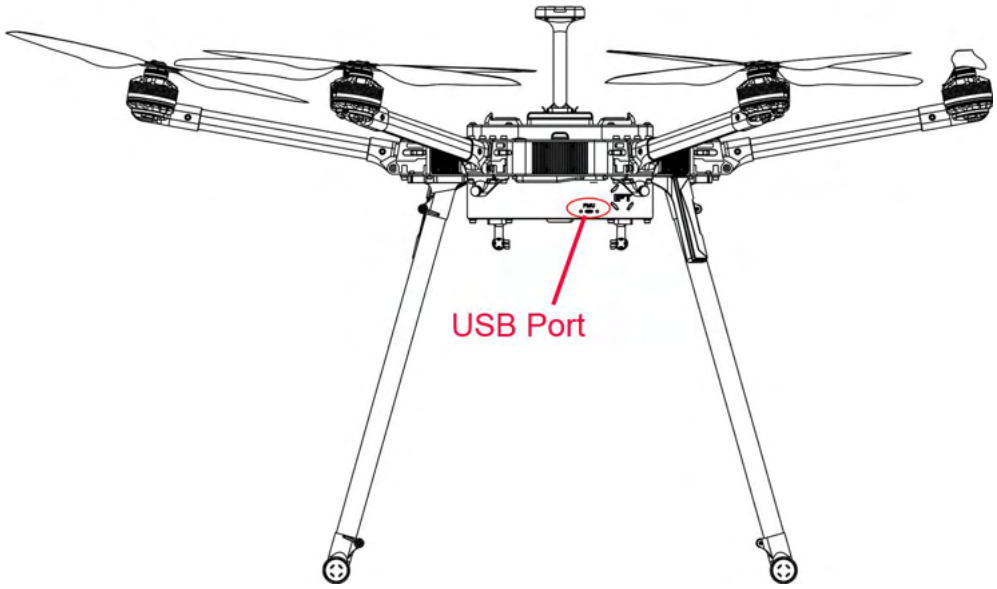
- Total Loss of aircraft: If a flyaway or battery depletion away from the home point occurs, follow the FAA guidelines on aircraft loss, and contact Inspired Flight for further instruction.

- Aircraft Crash: If the aircraft is flown into an obstruction or crashes for any reason, follow the procedure in the FAA guidelines, and contact Inspired Flight for further instruction.

- Other: If any other anomaly or unexpected failure occurs, please contact Inspired Flight. Refer to the Contact Information in the front of this manual.

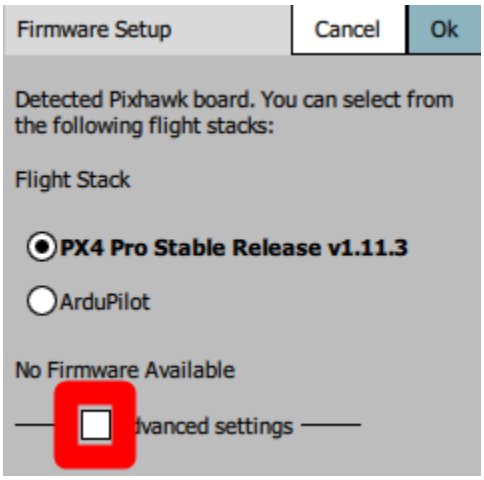
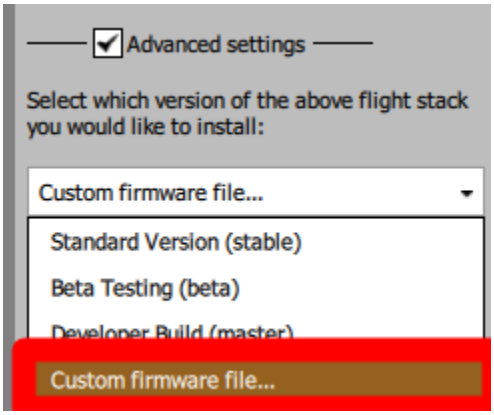
Upgrading the Aircraft Firmware

Note: Firmware upgrades are only necessary if advised by Inspired Flight. The aircraft comes with firmware installed at the factory.

Step	Action
1	Completely power off the aircraft.
2	Open QGroundControl on a PC.
3	Open the Settings tab, then Vehicle Setup. 
4	Click on Firmware. 
5	Connect a USB-C cable between the aircraft USB port (see below), and the device with QGC.
	
6	Power on the aircraft.

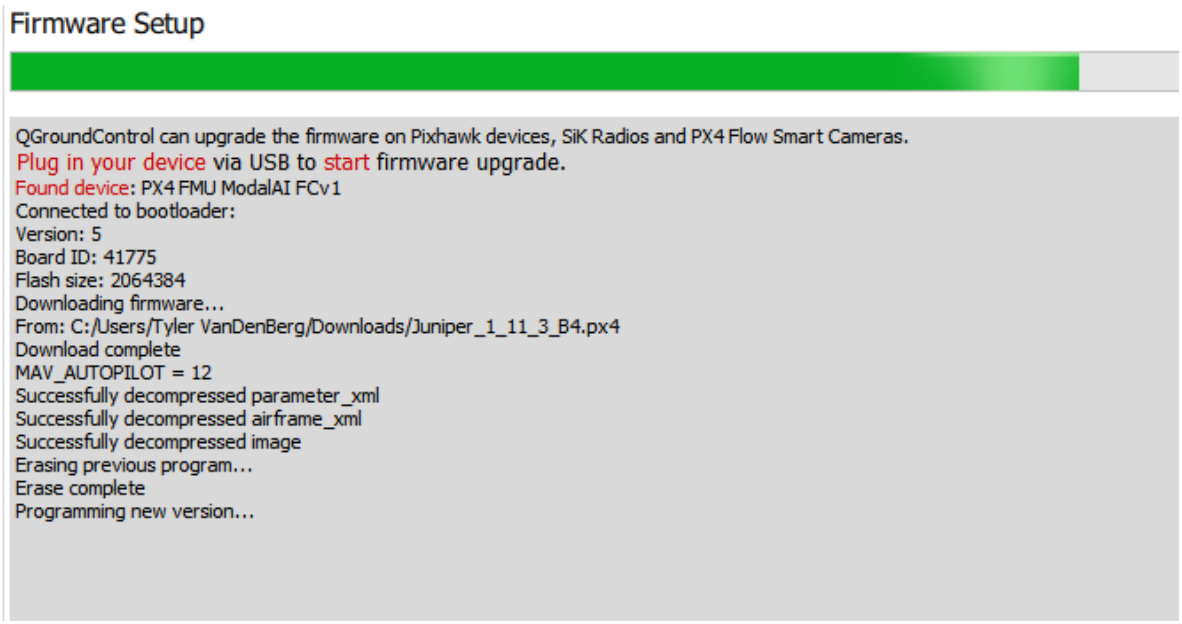
Continued next page

Upgrading the Aircraft Firmware, Continued

Step	Action
7	On the right side of the PC's screen, a 'Firmware Setup' window will appear. Select the 'Advanced Settings' checkbox (see below).
	
8	Under the dropdown menu, select 'Custom firmware file' (see below). Select 'OK.'
	
	Continued next page

Upgrading the Aircraft Firmware, Continued

Step	Action
9	Navigate to the correct firmware file, and select ‘Open’.
10	Wait about one minute for the firmware to upgrade. The beeping will stop when the upgrade is complete. Below is a screenshot of the firmware upload progress.



End of Procedure

Calibrate the Compass

This section describes how to calibrate the internal compass in the aircraft.

NOTE	The aircraft's compass is calibrated at the factory and typically does not need to be re-calibrated. Compass calibration may be necessary if significant hardware changes have been made or if metal has been added to or removed from the aircraft.

Compass calibration is done through the autopilot software in the aircraft. Complete instructions are available at the following link:

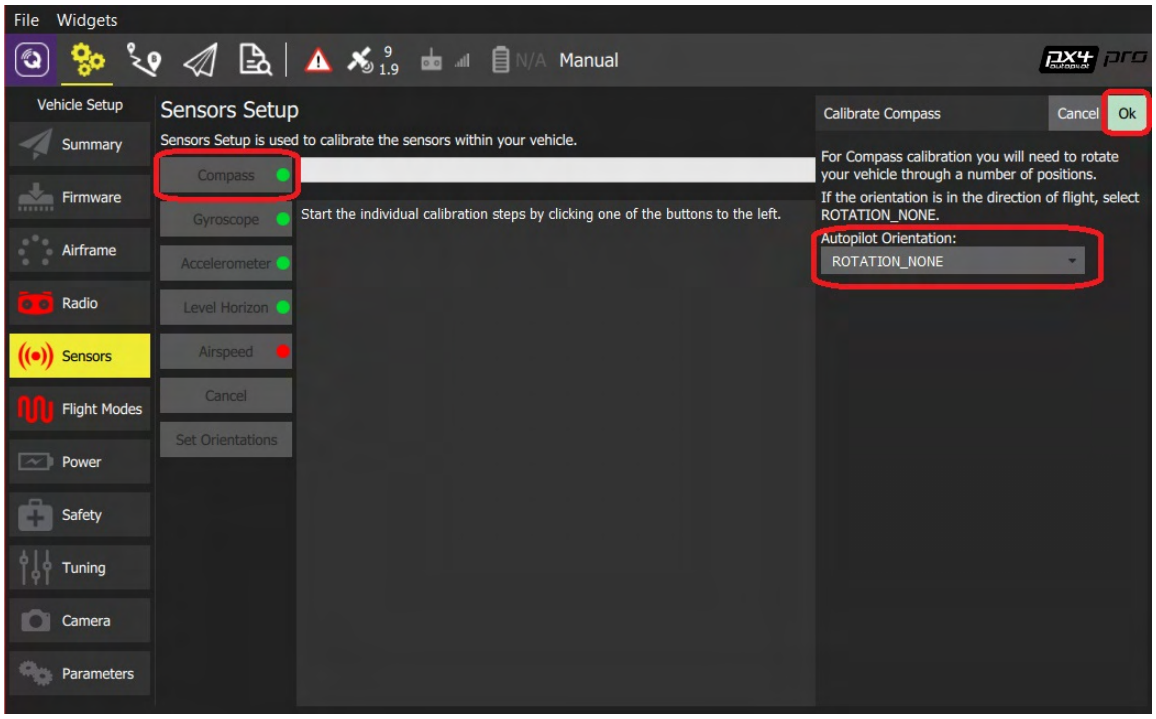
https://docs.px4.io/master/en/config/compass.html

Indications that the compass may require calibration include:

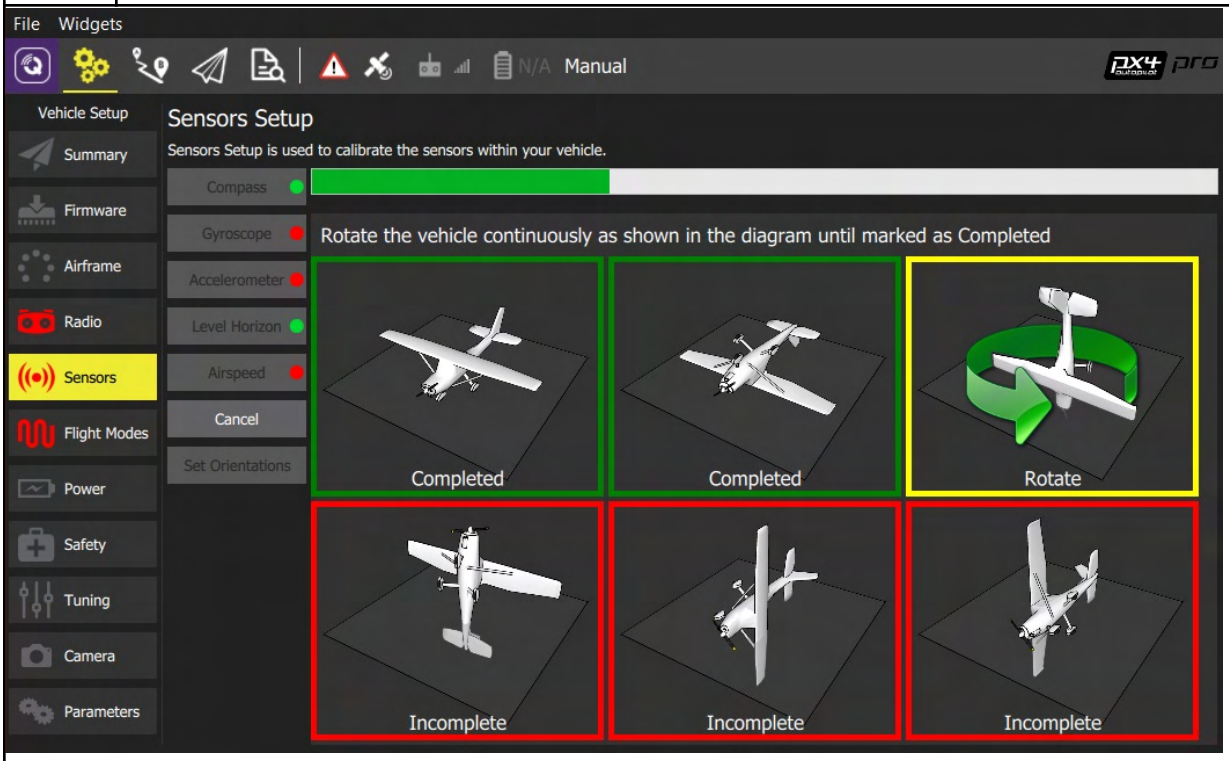
- Toilet bowling (circling during hover)
- Veering off-path when attempting to fly straight.

Step	Action
1	Choose a good location for compass calibration, away from magnetic fields and metal.
NOTE	Metal is not always obvious! Do not calibrate on top of an office table (often contains metal bars) or next to a aircraft. Calibration can even be affected if you're standing on a slab of concrete with uneven distribution of rebar.
2	Power on the ground station (with QGroundControl installed), and open QGroundControl.
3	Connect the aircraft to the ground station.
4	Power on the aircraft.
Continued next page	

Calibrate the Compass, Continued

Step	Action
5	In QGC, select the Gear icon (Vehicle Setup) in the top toolbar, and then Sensors in the left sidebar (see below).
	
6	Click the Compass button.
7	Click OK to start the calibration.
	Continued page

Calibrate the Compass, Continued

Step	Action
NOTE	The steps that follow are excerpted from the PX4 User Guide, and show a fixed-wing aircraft. The orientations apply to a rotary wing aircraft as well.
8	The display shown below appears. Orientations shown in red are “incomplete,” and must be calibrated. Orient the aircraft as shown, and hold it still. Once prompted (the orientation-image turns yellow) rotate the aircraft around the specified axis in either/both directions. Once the calibration is complete for that orientation, the border of the image becomes green.
	
9	Repeat the calibration for all aircraft orientations until all orientations have a green border.
10	Reboot the aircraft prior to flight.
End of Procedure	

Calibrate the Accelerometers

This section describes how to calibrate the accelerometers on the aircraft. Accelerometer calibration is not normally required unless instructed by Inspired Flight Customer Support. For more information about this procedure, click the following link:

https://docs.px4.io/v1.9.0/en/config/accelerometer.html

Step	Action
1	Start QGroundControl and connect it to the aircraft.
2	Select the Gear icon (Vehicle Setup) in the top toolbar and then Sensors in the sidebar (see figure below).
3	Click the Accelerometer sensor button.
NOTE	The Accelerometer Orientation is set with the autopilot parameter file and should not be changed during calibration.
Continued next page	

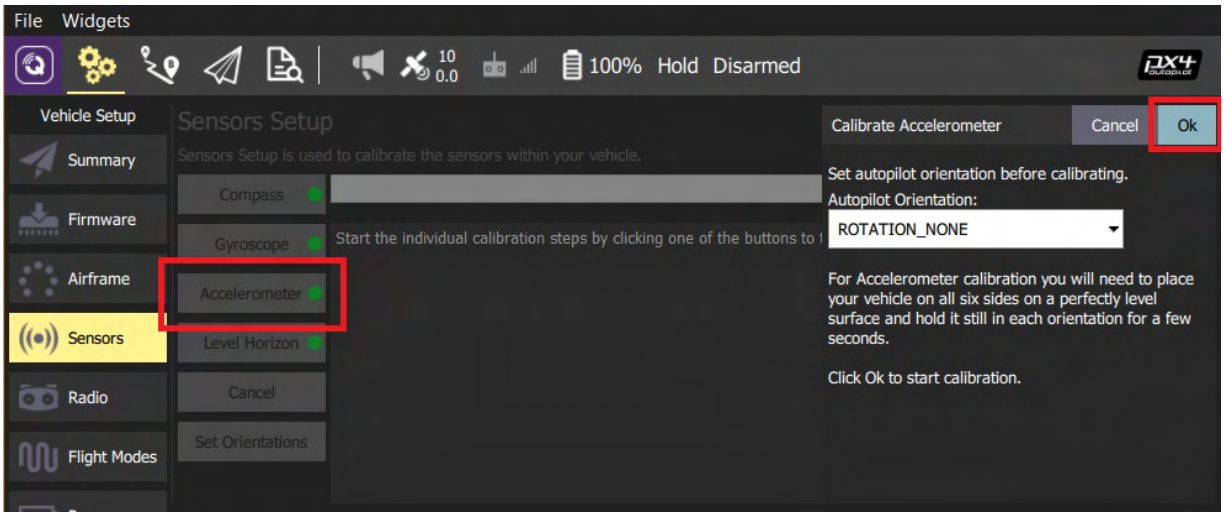


Figure 25. Select the Accelerometer

Calibrate the Accelerometers, Continued

Step	Action
4	Click OK to start the calibration.
5	Position the aircraft as shown by the images on the screen (see figure below). An orientation image's border will turn yellow, prompting you to hold the aircraft still in the orientation shown.
6	Once the calibration is complete for an orientation, the border for the orientation turns green.
7	Repeat the calibration process for all aircraft orientations.
8	Once you've calibrated the aircraft in all of the orientations, QGroundControl displays Calibration complete (all orientation images will be displayed in green and the progress bar will fill completely). You can then proceed to the next sensor.
End of Procedure	

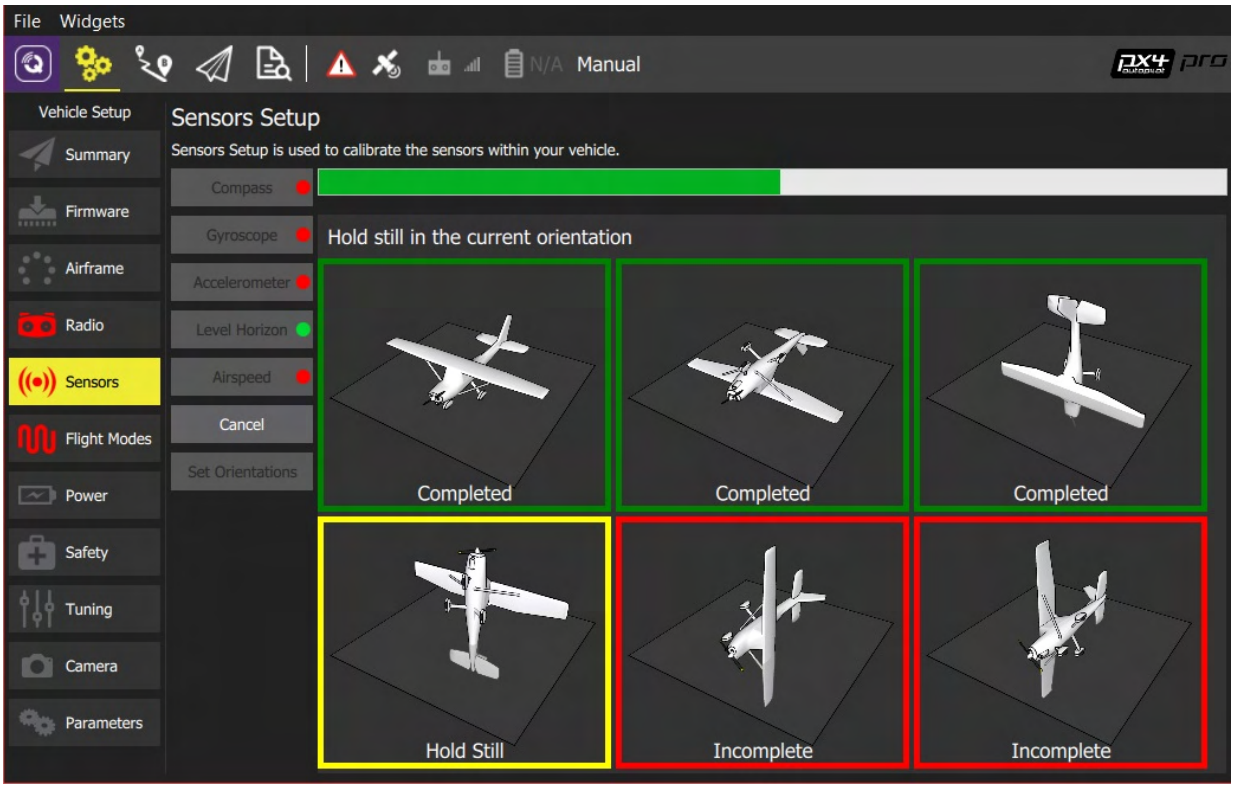


Figure 26. Aircraft Orientations for Accelerometer Calibration

IF1200 Maintenance Schedule

	Maintenance Intervals (Every X Flights)							
Recommended Maintenance Activities	Every 1 Flight	10 Flights	25 Flights	50 Flights	100 Flights	400 Flights	800 Flights	1600 Flights
Inspect all moving components for wear/damage.	X							
Check propellers for damage.	X							
Dust all lenses	X							
Inspect all visible screws & tighten if needed.		X						
Clean aircraft & all motors with an air can			X					
Examine batteries and motors for wear and tear, replace as needed				X				
Replace the following parts:								
Propellers						X		
Motor Bearings						X		
Battery							X	X
Motors								X

Maintenance Assumptions

1. For the maintenance schedule above, flights are assumed to be 30 minutes in length.
2. Proper care of aircraft is taken during flight and in storage.

Maintenance & Spares Cost

1. Battery Replacement - $1000 each
2. TM 18x5.9 Propeller Replacement - $250 per pair
4. Landing Gear Replacement - $650 per Leg
5. GPS Antenna Mount Replacement - $350
6. Bearing Service - $500
7. Motor Replacement - $300 each

Estimated Total Maintenance cost per 1600 flights (800 hours) - $8000

The operator is responsible for providing a system to log flight times and maintenance performed.

Revisions

Revision Number	Changes	Date approved
3.00	● New format ● Added section in Appendix on Security Risks and Mitigation	