



# IF750 Quadcopter

HereLink Blue  
HereLink Black  
LRT



User Manual

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# 1. Safety Information, Notes, and References

The IF750 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.

<b>NOTE</b>	Offers important information about a topic.
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## References

References to other places in this document and to other documents and web pages look as shown below. Clicking (selecting) the reference takes you to the location of the reference.

[Safety Information, Notes, and References](#)

## 2. IF750 Overview

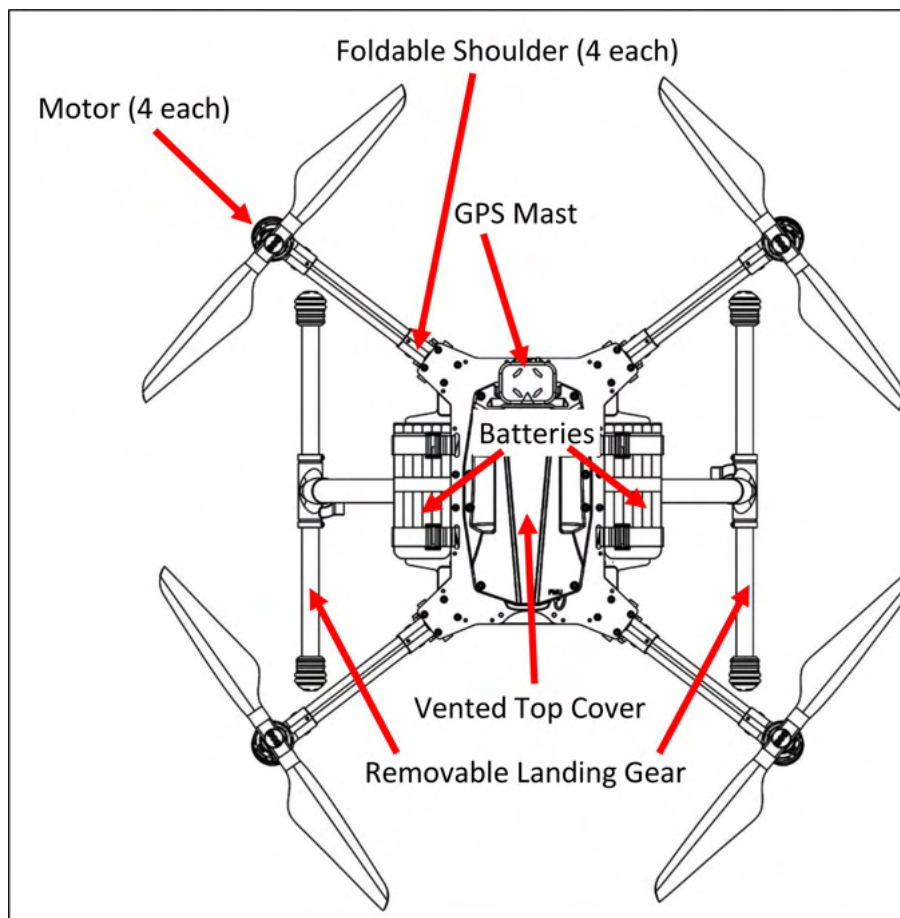
The IF750 is an American-made, NDAA-compliant heavy-lift quadcopter. This User Manual describes how to utilize the full functionality of this aircraft to meet your most demanding needs.

There are three models of the IF750, which differ according to which hand controller they use:

- IF750 HereLink Blue: uses the Union Robotics HereLink Blue hand controller
- IF750 HereLink Black: uses the Cube Pilot HereLink Video Transmission hand controller
- IF750 Long Range Telemetry (LRT): uses the Jeti DS-12 hand controller in conjunction with the RFD900x-US radio.

All three versions of the IF750 are identical except for the hand controller. This User Manual describes all three versions.

Figure 1 shows the major components of the IF750 aircraft.



**Figure 1. IF750 Orientation (Top View)**

## 3. Hand Controllers

The IF750 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.

 A blue handheld remote control with a black screen in the center, two joysticks on the sides, and a carrying handle on top.	<p>HereLink Blue (Union Robotics)</p> <p>Uses QGroundControl</p> <p><a href="#">HereLink Blue Hand Controller</a></p>
 A black handheld remote control with a color screen displaying flight data, two joysticks, and two antennas.	<p>HereLink Black (CubePilot HereLink HD video transmission system)</p> <p>Uses QGroundControl</p> <p><a href="#">HereLink Black Hand Controller</a></p>
 A black handheld remote control with a color screen, two joysticks, and various buttons. The brand name 'duplex' is visible at the bottom.	<p>IF1200 Long Range Telemetry (LRT)</p> <p>Uses a Jeti DS-12 hand controller and RFD900x-US long range telemetry radio</p> <p>Uses QGroundControl</p> <p><a href="#">Long Range Telemetry (LRT)</a></p>

## 4. HereLink Blue Hand Controller

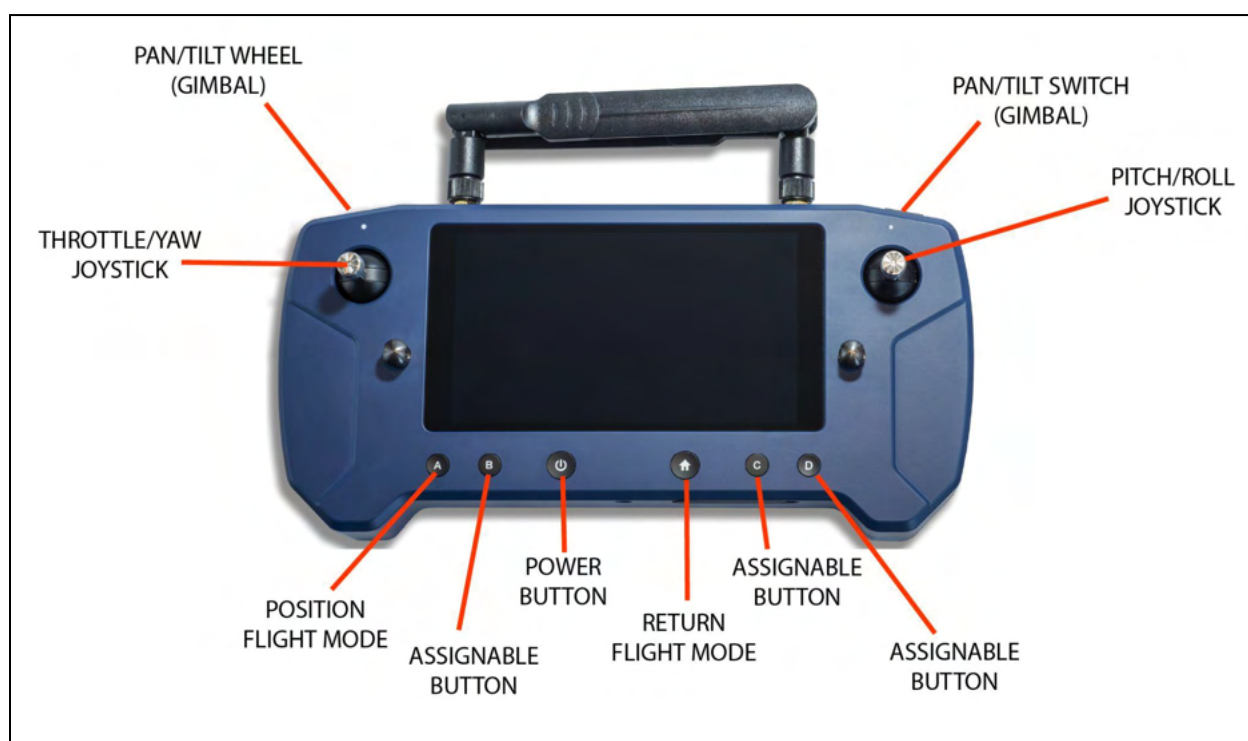
### Description

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.

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



**Figure 2. HereLink Blue Hand Controller**

## 5. HereLink Black Hand Controller

### Description

This IF750 version uses the HereLink Black GCS, made by CubePilot.

The HereLink Black GCS User Guide can be found online at:

<https://www.cubepilot.com/#/herelink/features>



**Figure 3. HereLink Black Hand Controller**



## 6. Long Range Telemetry (LRT)

### Description

The LRT kit includes:

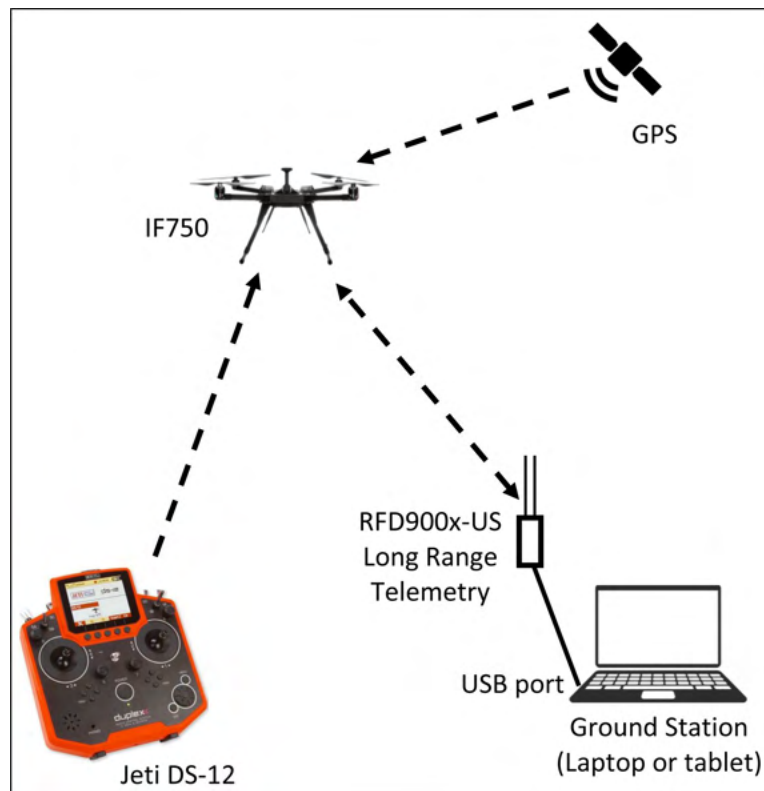
- IF750 aircraft
- Jeti DS-12 hand controller
- RFD900x-US telemetry radio

Customer-supplied:

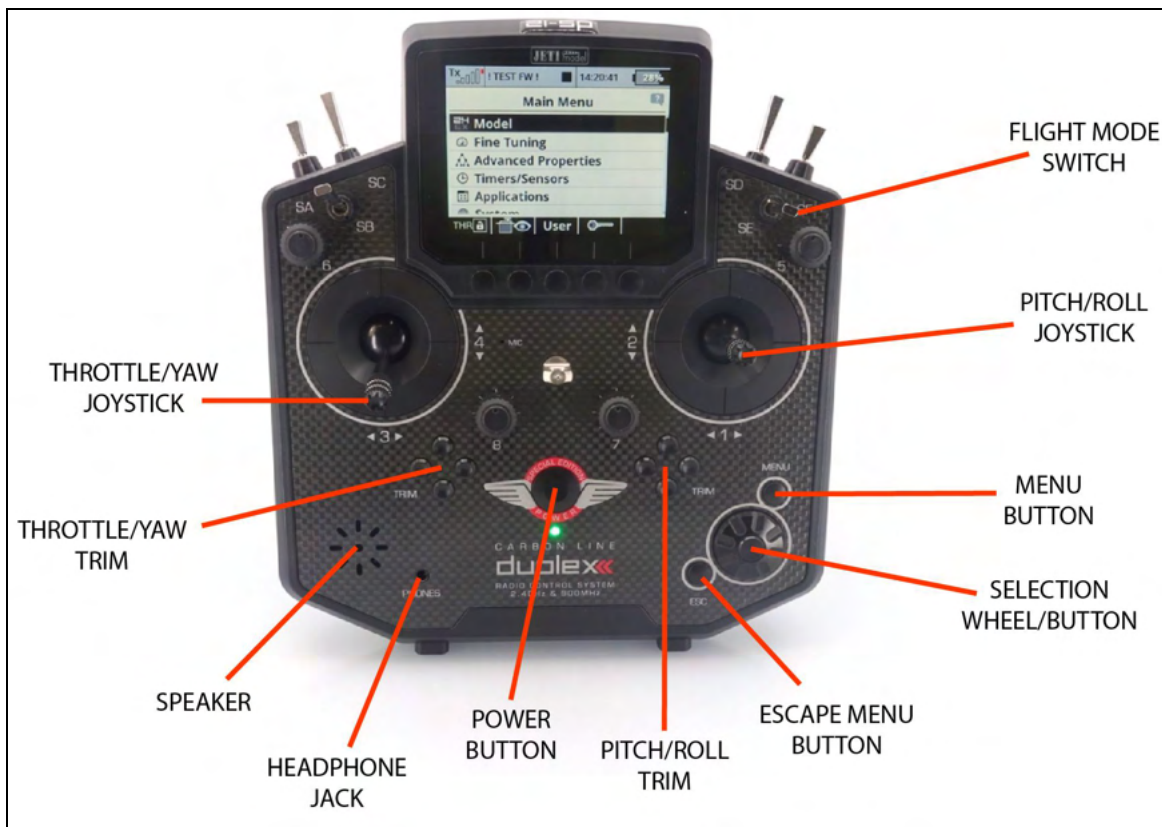
- Laptop or tablet, with QGroundControl installed. The RFD900x-US telemetry radio plugs into a USB port on this device.

The RFD900x-US telemetry radio connects to a USB port on the laptop or tablet. The device, (laptop or tablet), operates as a ground control station.

Figure 4 below shows the components of the LRT.



**Figure 4. Long Range Telemetry Configuration**

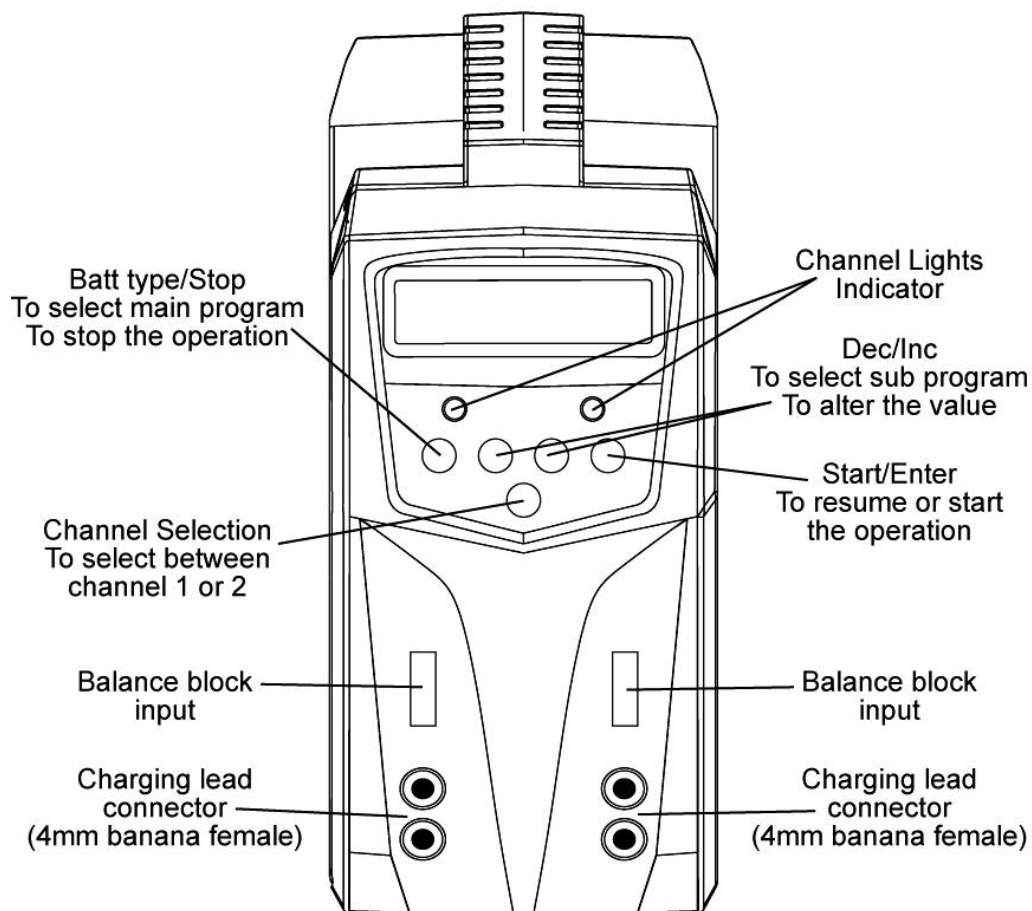


**Figure 5. Jeti DS-12 Hand Controller**

## 7. Battery Charging

The IF750 kit includes a Venom ProDuo battery charger. The manual can be found online at the following link:

<https://www.vertigodrones.com/assets/images/0685%20ProDuo%20Charger%20Manual.pdf>.



**Figure 6. Venom ProDuo 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.



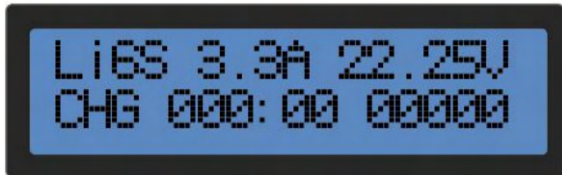
### NOTE

**Balancing cells:** The flight batteries used in the IF750 contain multiple cells. Differences in the voltages between cells degrades the performance of the battery, and shortens its life. The battery charger included with the aircraft has a function for balancing the voltages of the cells. Read the included manual to implement this function


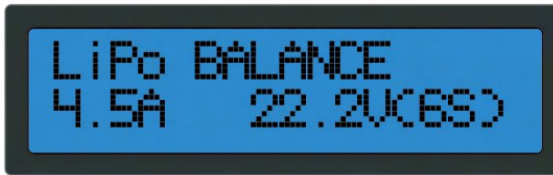
Step	Action
1	Locate the Venom ProDuo battery charger (see Figure 6 on previous page).
2	Connect the charger to a power source (100V–240 VAC or 11.0V–18.0 VDC). The display becomes active as soon as you apply power to the charger. See below.
	
3	On the charger front panel, verify that the Channel 1 LED is lit (see <a href="#">Figure 6</a> on previous page). If it is not lit, press the Channel Select button to select Channel 1.
Continued next page	

Step	Action
4	Press the Start/Enter button. If the display shown below does not appear, press the Increase button until it does.
5	In the aircraft kit, locate one of the charging cables (see below). Plug the red and black banana plugs into the corresponding jacks on Channel 1 of the charger.
6	Locate the Balance Breakout Board (see below). Plug the loose end of the cable into Balance Port 1 on the charger.
7	If using the batteries supplied by Inspired Flight Technologies, locate the Battery Balance Connector (see below). Insert the connector into the largest connector on the Balance Breakout Board (see Step 6).
Continued next page	

Step	Action
<div> <b>WARNING</b></div> <p>In the following steps, the charging cables and balance connector from Channel 1 on the charger <b>MUST</b> be connected to the same battery. This applies to Channel 2 as well. Failure to do so could damage the batteries and may start a fire.</p>	
8	<p>Connect the charging cable from Channel 1 on the charger to the battery charging connector on the battery.</p> <p><b>NOTE:</b> If using the batteries supplied with the aircraft (Tattu 7000 mAh batteries), plug the charging cable into the connector shown below.</p>
<div> <b>WARNING</b></div> <p><b>DO NOT</b> disconnect charging cables from the charger while the flight batteries are connected to the charger. Doing so may result in electrical arcing, causing severe burns to the operator.</p>	
	
9	<p>Plug the battery balance connector on the battery into the loose end of the Battery Balance Connector (see Step 7).</p>
Continued next page	

Step	Action
10	Start the charging process by pressing the Start button on the charger for 3 seconds. This opens the battery check screen (see below), which confirms that you have the right battery connected (a 6S battery pack).
	
11	When the display shown below appears, press the Enter button to confirm that this is the correct battery.
	
12	The display shown below appears when charging has started.
	
13	The charger beeps, and displays 'Full' when the charging is complete.
14	Repeat this procedure to connect and charge the second aircraft battery.
End of Procedure	

## If Incorrect Charging Current / Cell Count is Displayed

Step	Action
 <b>If Incorrect Charging Current/Cell Count is displayed, follow the steps below.</b>	
1	From the main LiPo Balance screen, click the enter button. This will start the current blinking. Using the increase or decrease buttons, adjust the current to 4.5A (see below).
	
2	Clicking enter again moves the cursor to the cell count. Use the increase or decrease buttons to select 6S. The screen should now match the image shown above.
<b>End of Procedure</b>	

## Charge the Hand Controller Batteries

Step	Action
1	In the aircraft kit, locate the hand controller and its charger.
2	Plug the charger into a power source, then connect the hand controller to the charger. Allow the hand controller's internal battery to reach a full charge before using.
<b>End of Procedure.</b>	

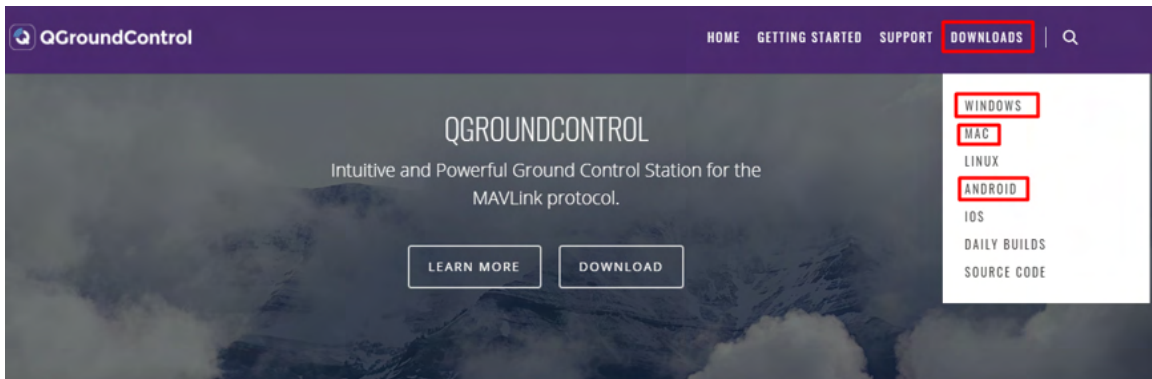


## 8. Install QGroundControl

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 <a href="http://qgroundcontrol.com/">http://qgroundcontrol.com/</a> . 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.
NOTE	QGC can be used on a device (laptop or tablet) in conjunction with a HereLink, if available. For instructions on setting up this configuration, see <a href="#">Wirelessly Connect a HereLink Hand Controller to a Ground Control Station</a> in the Appendix.
End of Procedure	

## 9. Assemble the Aircraft

Step	Action
1	Each landing gear is made of two parts (see Figure 7 below).
2	Assemble the first landing gear: Loosen the clamp on the horizontal tube (with rubber feet), then insert the vertical tube fully into the horizontal tube. The notches on the end inserts line up perpendicularly to the horizontal tube. <b>Note:</b> If there are o-rings on the vertical tube, insert the tube so that the o-rings are on the lower half of the assembly.
Continued next page	

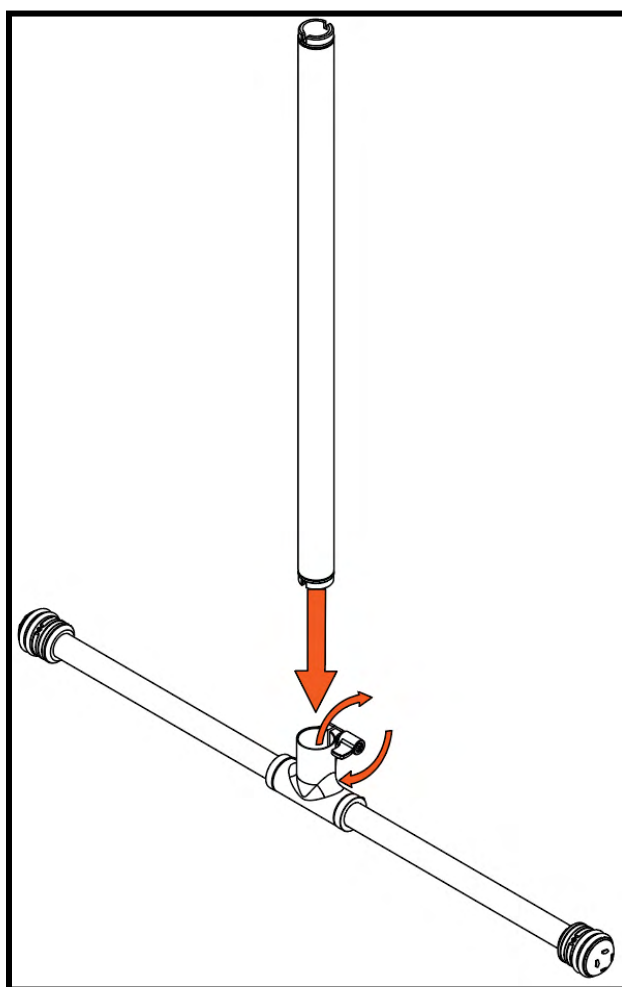
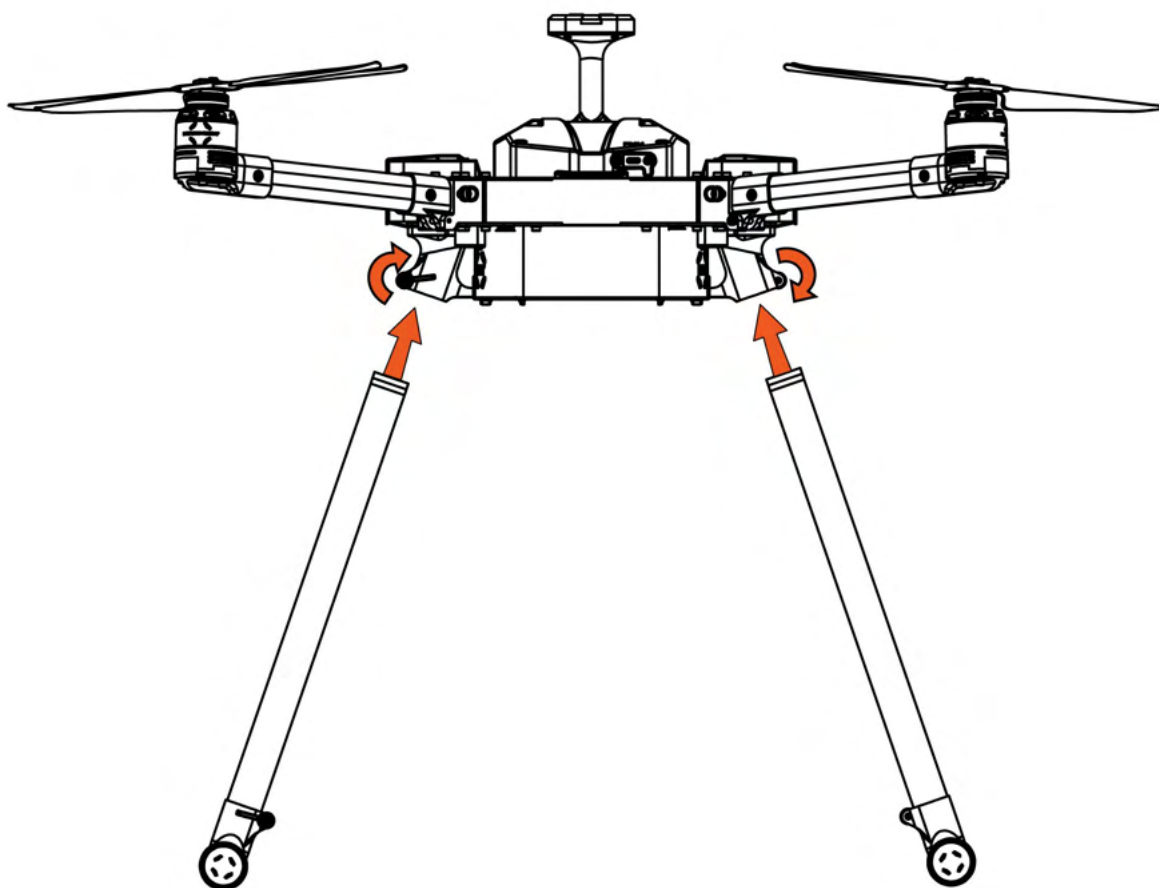
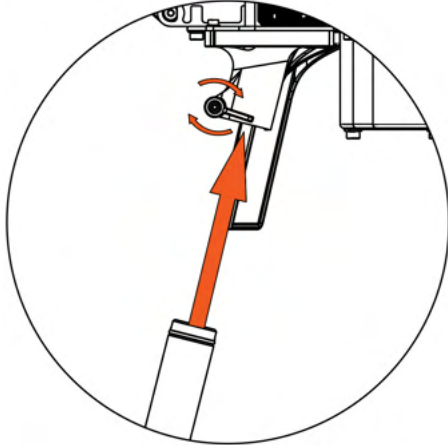
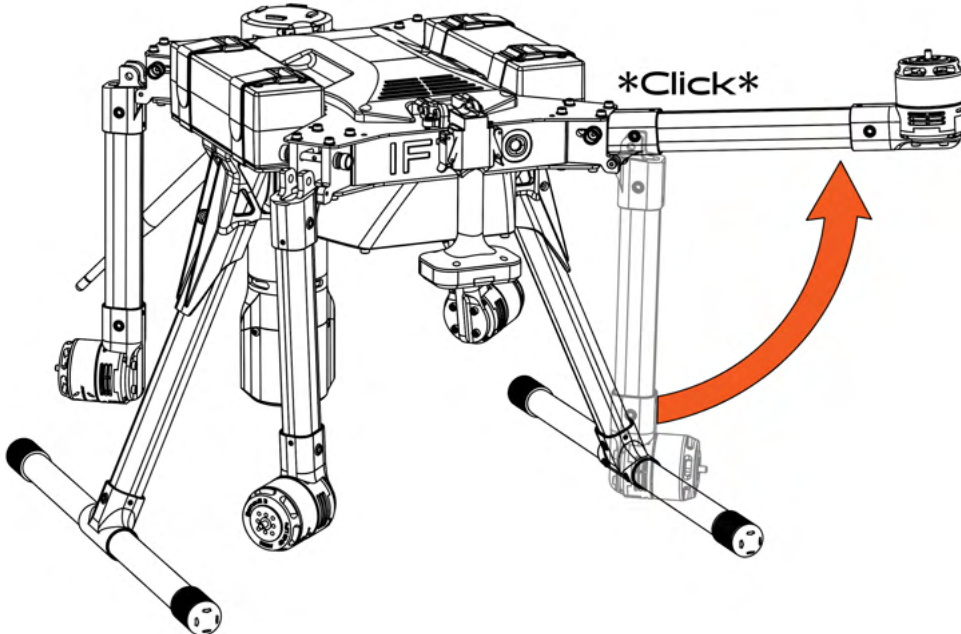


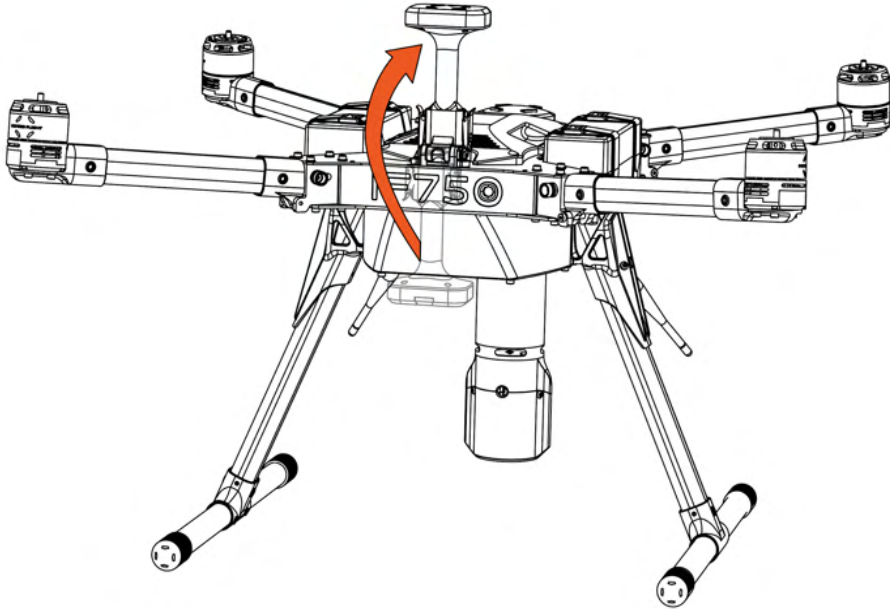
Figure 7. IF750 Landing Gear

Step	Action
3	Ensure the vertical tube is fully seated before tightening the ratcheting clamp.
4	The ratcheting arm can be pulled away from the screw to move the arm to a more convenient location when tightening. Tighten the clamp.
5	Repeat steps 2 through 4 to assemble the second landing gear.
6	The next steps are most easily done by holding the aircraft upside down with one hand and inserting the landing gear with the other.
7	Insert the landing gear legs into the corresponding sockets on the underside of the body (see below).


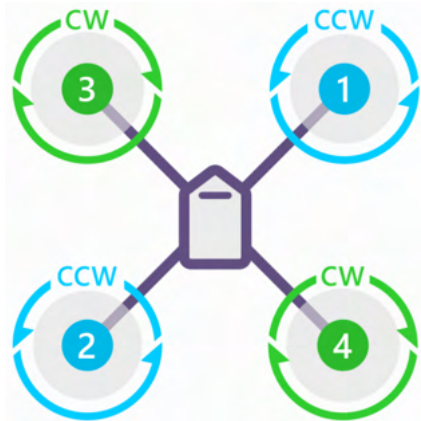





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Step	Action
8	<p>Ensure the vertical tubes are fully seated before tightening the thumb screws. The thumb screws can be pulled away from the hip and adjusted so the thumb screw points in a convenient direction.</p>
	
9	<p>Unfold the four aircraft arms into the upright position. The arms will lock into place in the shoulders. <b>Note:</b> The batteries are shown installed in the graphic below.</p>
	
Continued next page	

Step	Action
10	Lift the GPS mast into place and latch the retaining clips on both sides (see below).
	
End of Procedure	




## Install the Propellers

Step	Action
<div> <b>WARNING</b></div> <p><b>DO NOT power up the aircraft prior to performing the following procedure. Accidental energizing of the propellers while performing this procedure can cause severe personal injury.</b></p>	
1	<p>Locate the correct propeller for each motor. Two of the aircraft's motors spin clockwise, and two spin counterclockwise. The two motor and propeller types are keyed and color-coded to ensure that the propellers are mounted on the correct motors.</p> 
2	<p>Counterclockwise motors have a silver propeller mount, while the clockwise motors have a black propeller mount. A counterclockwise motor with a silver mount is shown below.</p> 
Continued next page	

Step	Action
3	Place each propeller on its corresponding motor, ensuring the captive screws in the propeller align with the corresponding screw holes on the motor. Verify each propeller is fully seated on the motor. Refer to the photograph below.
	
4	Use the included green-handled screwdriver to tighten the captive screws in the propellers, ensuring not to over-tighten.
5	Use the included torque wrench to tighten each captive screw to 0.9 NM.
	
6	Verify the propellers are fully seated and secure, and parallel to the top surface of the motors.
<b>End of procedure</b>	



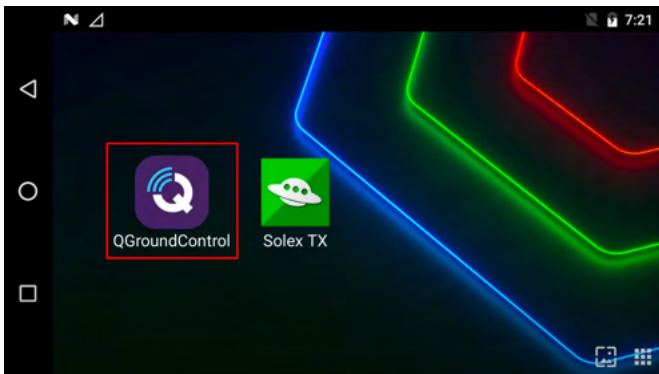

## Install the Batteries in the Aircraft


Step	Action
<div>  <b>CAUTION</b> </div>	Ensure both batteries are fully charged before installing in the IF750. If the voltage difference between the batteries is greater than 0.3V, top off the two batteries on the charger.
Step	Action
1	Slide the batteries into the battery compartments on both sides of the aircraft. Ensure that: <ul style="list-style-type: none"> <li>• The battery straps on the airframe are pulled out of the way</li> <li>• The side of the battery with the balance plug is facing up.</li> <li>• The battery wires face the rear of the aircraft (away from the GPS mast)</li> </ul>
2	Secure the batteries to the frame, pulling tight on the velcro straps. Center the Velcro overlaps on the top of each battery.
<div>  <b>CAUTION</b> </div>	Secure the balance wires and plugs under the Velcro straps as shown below before tightening the straps. This prevents the balance plugs from obstructing the propellers.
	
<b>End of procedure</b>	



## 10. Using HereLink Hand Controllers

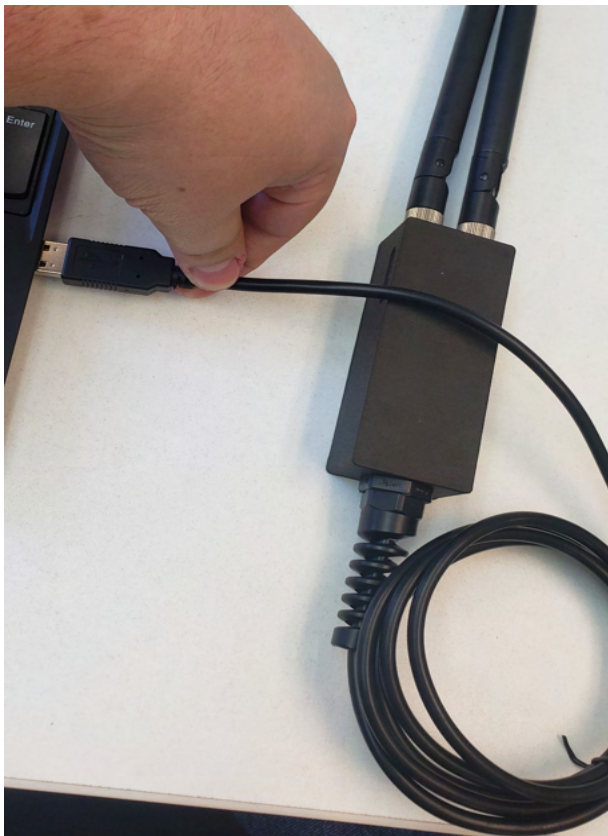
Both the HereLink Blue and HereLink Black hand controllers have QGroundControl (QGC) software installed at the factory. QGC is extremely well documented and new users are encouraged to review the user guide at: <https://docs.qgroundcontrol.com/en/>. Training videos describing all aspects of planning 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. <b>Note:</b> 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.
<b>Note:</b> QGC can be used on a HereLink or on a laptop receiving a Wi-Fi signal from the HereLink. See <a href="#">Wirelessly Connect a HereLink Hand Controller to a Ground Control Station</a> for instructions on setting this up.	
Continued next page	

Step	Action
4	<b>GPS satellite count and status:</b> 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	

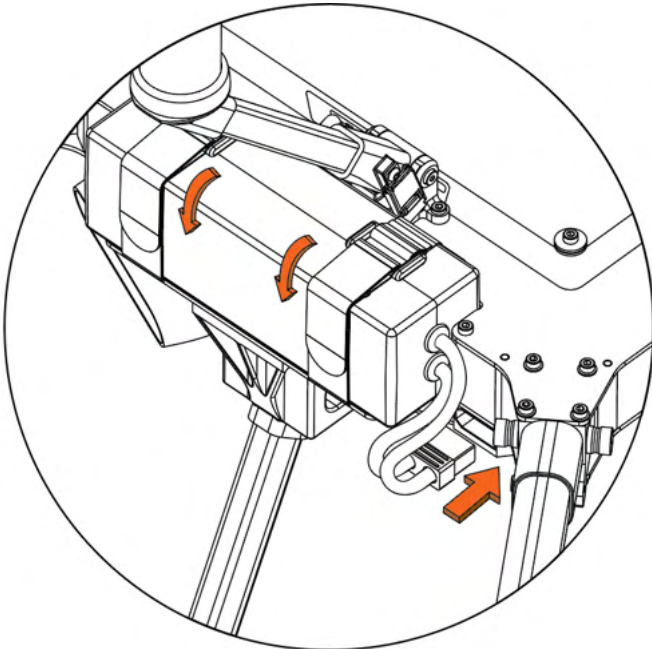
## 11. Set Up the Long Range Telemetry Radio

**Note:** The IF750 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 with the RFD900x-US radio connected to it and QGC installed is required.

Step	Action
<b>NOTE:</b> 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).
	
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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

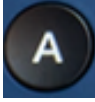

Step	Action
1	<p>Plug in both batteries' XT90 connectors into the corresponding female ports near the rear shoulders (see below).</p> <p><b>Note:</b> Ensure the battery connectors are fully seated in the ports to avoid loose connections.</p>
	
2	<p>The aircraft will emit a series of beeps during the initialization sequence. The GPS status indicator displays as follows:</p> <ul style="list-style-type: none"> <li>• <b>Blue flashing:</b> Waiting for GPS lock</li> <li>• <b>Green Flashing or Green and Red flashing:</b> GPS Lock obtained, ready to fly, disarmed.</li> <li>• <b>Green solid:</b> GPS lock obtained, armed.</li> <li>• <b>Red flashing:</b> Error - See QGroundControl for error message details, or reboot the aircraft.</li> </ul>
3	<p><b>Navigation LEDs:</b> There are four navigation LEDs on the aircraft:</p> <ul style="list-style-type: none"> <li>• Front-left: Red (port)</li> <li>• Front-right: Green (starboard)</li> <li>• Rear: a white LED, on each rear motor</li> </ul>
<p style="text-align: center;"><b>End of Procedure</b></p>	

# 13. Flight Modes

## Flight Mode Descriptions

Flight Mode Descriptions	
Mode	Description
<b>Altitude</b>	<p>The aircraft maintains altitude, but its horizontal position is controlled by the pilot.</p> <p> <b>Caution:</b> 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.</p>
<b>Position</b>	<p>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).</p>
<b>Return to Launch (RTL)</b>	<p>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.</p>
<b>NOTE</b>	<p>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.</p>
 <b>CAUTION</b>	<p>The IF750 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 batteries conservatively to mitigate risk.</p>

## Flight Mode Switches

Flight Mode Controls		
Control	Flight Mode	Location on Hand Controller
	Position	<b>HereLink:</b> Button at the bottom of the front panel. <b>Jeti DS-12:</b> Top and mid-position of three-way switch on upper-right of front panel.
	Return to Launch	<b>HereLink:</b> Button at the bottom of the front panel. <b>Jeti DS-12:</b> Bottom position of three-way switch on upper-right of front panel.



## Selecting a Flight Mode on the LRT Jeti DS-12

On the Jeti DS-12, there is a three-position switch on the upper-right corner of the front (see Figure 9 below) for selecting one of two flight modes:

- Top and middle: **Position**
- Bottom: **Return to Launch**

**Note:** When the Mode Switch on the Jeti DS-12 (see figure 9 below), is used to switch flight modes, the QGroundControl display on the ground control station updates to show the new flight mode.



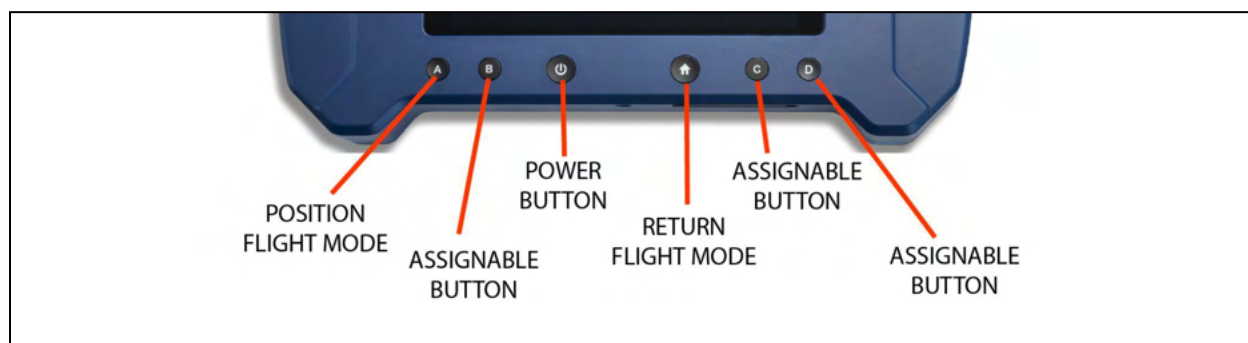
Figure 8. Flight Mode Switch on Jeti DS-12.



## Selecting the flight mode on the HereLink

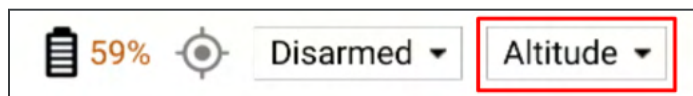
Figure 10 below shows the locations of the flight mode buttons on the HereLink hand controller.

**Note:** A HereLink Blue is shown. The flight mode buttons are in the same locations on the HereLink Black.



**Figure 9. Flight Mode Buttons on HereLink Hand Controller**


The current flight mode is indicated in the top right corner of the QGC display (see Figure 8 below). **Altitude** mode (see below) is usually the default mode until the aircraft has been outside long enough to obtain a GPS lock.




**Figure 10. Altitude Mode Shown**

## 14. Arm and Disarm

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

Step	Action
<b>Arming</b>	
1	Verify each item on the Preflight Checklist (see the end of this User Manual).
2	<p><b>Arm</b> 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.</p> <p><b>Note:</b> a Jeti DS-12 is shown below. These instructions also apply to the HereLinks.</p>
	
<b>Disarming</b>	
1	<p><b>Position Mode:</b> Once the aircraft has landed, hold the throttle down and to the left (see above). The propellers stop spinning.</p> <p><b>Autonomous Mode:</b> The aircraft automatically disarms upon landing.</p>
<b>End of Procedure</b>	

## 15. Takeoff and Landing

Step	Action
<b>Takeoff</b>	
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.
<div>  <b>CAUTION</b> </div> <p>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.</p>	
<b>Landing in Position Mode</b>	
1	<p>Be sure the landing site is level and clear of obstructions.</p> <ul style="list-style-type: none"> <li>• If the takeoff and landing locations are the same, the aircraft slows itself before landing.</li> <li>• If the aircraft is landing at a location where the elevation is different from takeoff, reduce throttle on landing.</li> </ul>
2	Lower the throttle completely until the aircraft has landed.
<b>Landing in Return to Launch Mode</b>	
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 joy sticks 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.
<b>End of Procedure</b>	

## 16. Power Off the Aircraft

Step	Action
1	Power down any Sony camera attached to the aircraft.
2	Disconnect the batteries by pulling on the connector, not the wires.
3	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 a 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.

## UI for Planning a Mission in QGC

Figure 11 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).

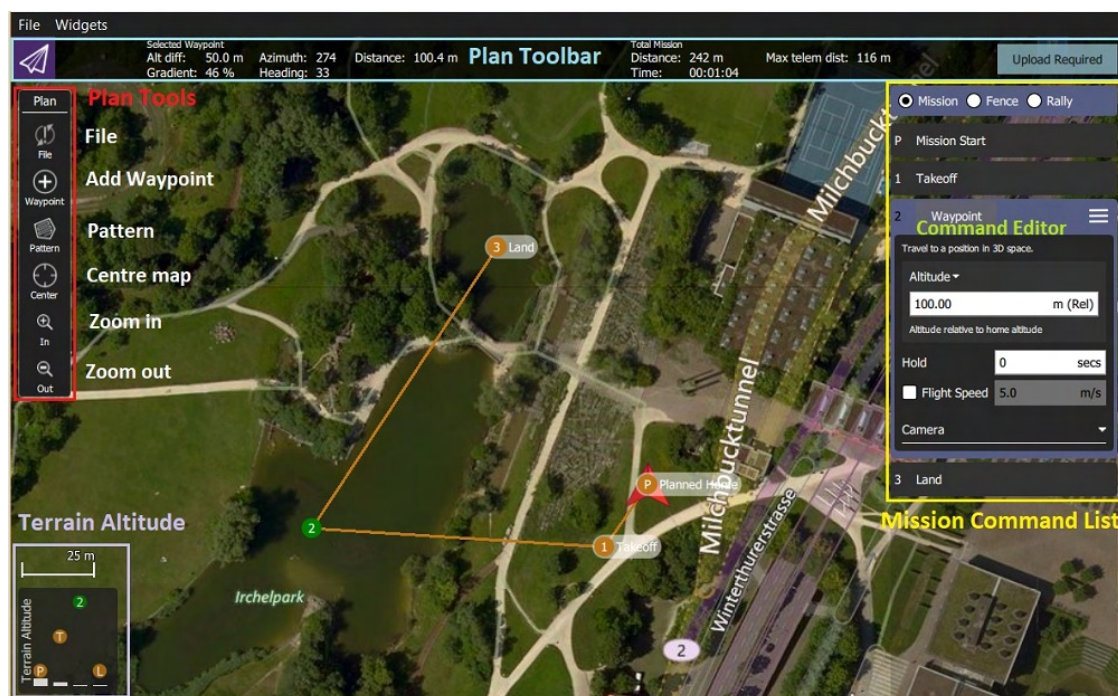


Figure 11. QGroundControl Screenshot of Mission Plan

## QGroundControl User Interface Overview

The main elements of the User Interface (UI) for planning a mission are described below (see Figure 11 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>

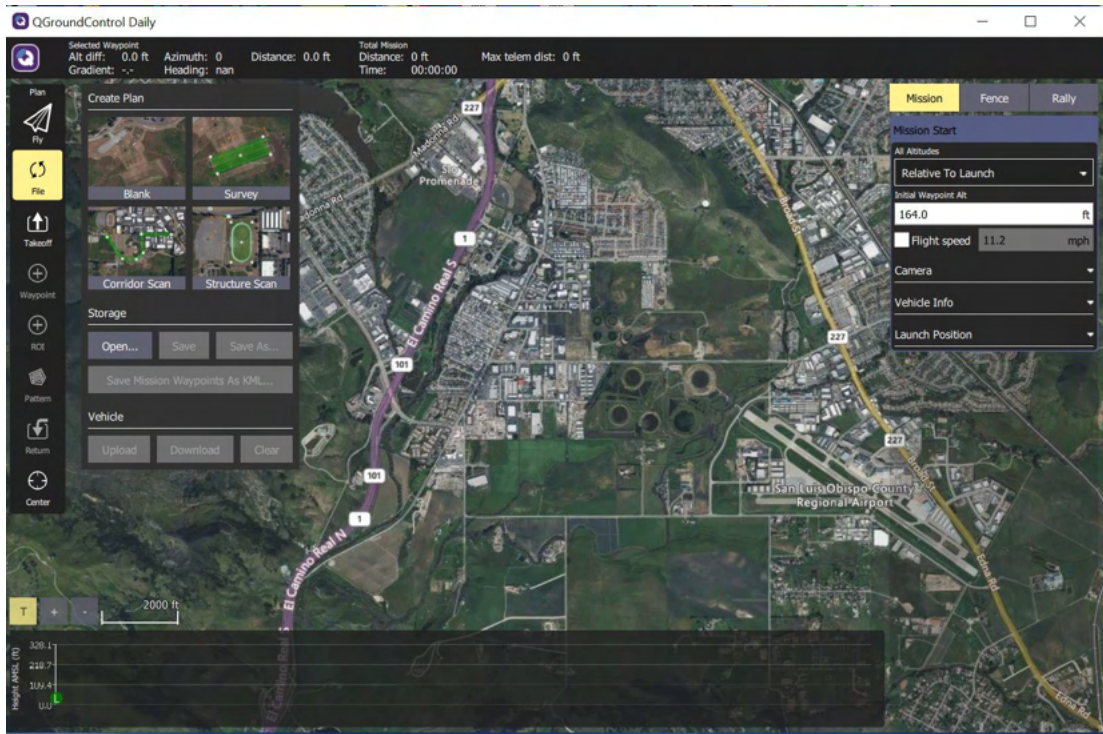
**Note 1:** in the following procedure, “select” means to tap (if using a touch screen), or mouse click (if using a mouse).

**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	



Step	Action
4	<p>On the left side of the screen, locate the Create Plan overlay. Select (mouse click or tap screen) Blank.</p> <p><b>Note:</b> Other Plan types are available. The Blank plan is chosen for illustration purposes for this example.</p> <p>The Blank plan screen is displayed (see below).</p> <p><b>Map navigation:</b> 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.</p>
 <p>The screenshot shows the QGroundControl Daily application window. On the left, a 'Create Plan' sidebar is open, showing four plan types: Blank, Survey, Corridor Scan, and Structure Scan. 'Blank' is selected. Below this are 'Storage' and 'Vehicle' sections. The main map area shows a satellite view of a region with roads and landmarks. On the right, a 'Mission' panel is visible with settings for 'Mission Start', 'Initial Waypoint Alt' (164.0 ft), 'Flight speed' (11.2 mph), and 'Launch Position'. The bottom left of the map has zoom controls (+, -, T) and a scale bar (2000 ft).</p>	
Continued next page	



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). <b>Note:</b> 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	

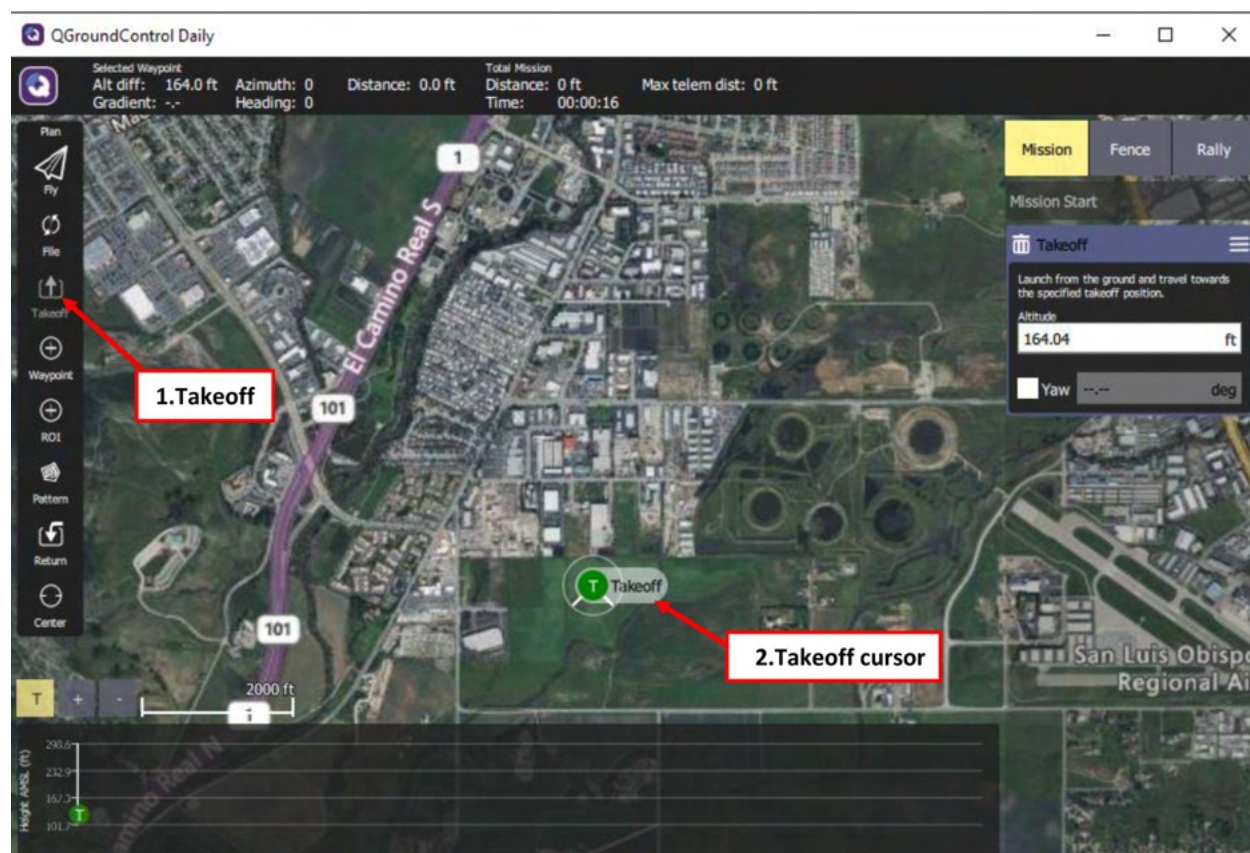


Figure 12. Selecting a Takeoff Point

Step	Action
7	Place the first Waypoint: <ol style="list-style-type: none"> <li>1. In the Plan Tools, select Waypoint (#1 below).</li> <li>2. Place the cursor on the map for the desired Waypoint location (#2 below), then select it</li> <li>3. Notice that the Waypoint panel appears on the right side of the screen when Waypoint was selected in the Plan Tools panel.</li> </ol>
8	Use the steps described in the previous step to add more waypoints as desired. <b>Note:</b> Waypoints may be deleted by selecting the trashcan icon at the top of the Waypoint panel.
Continued next page	

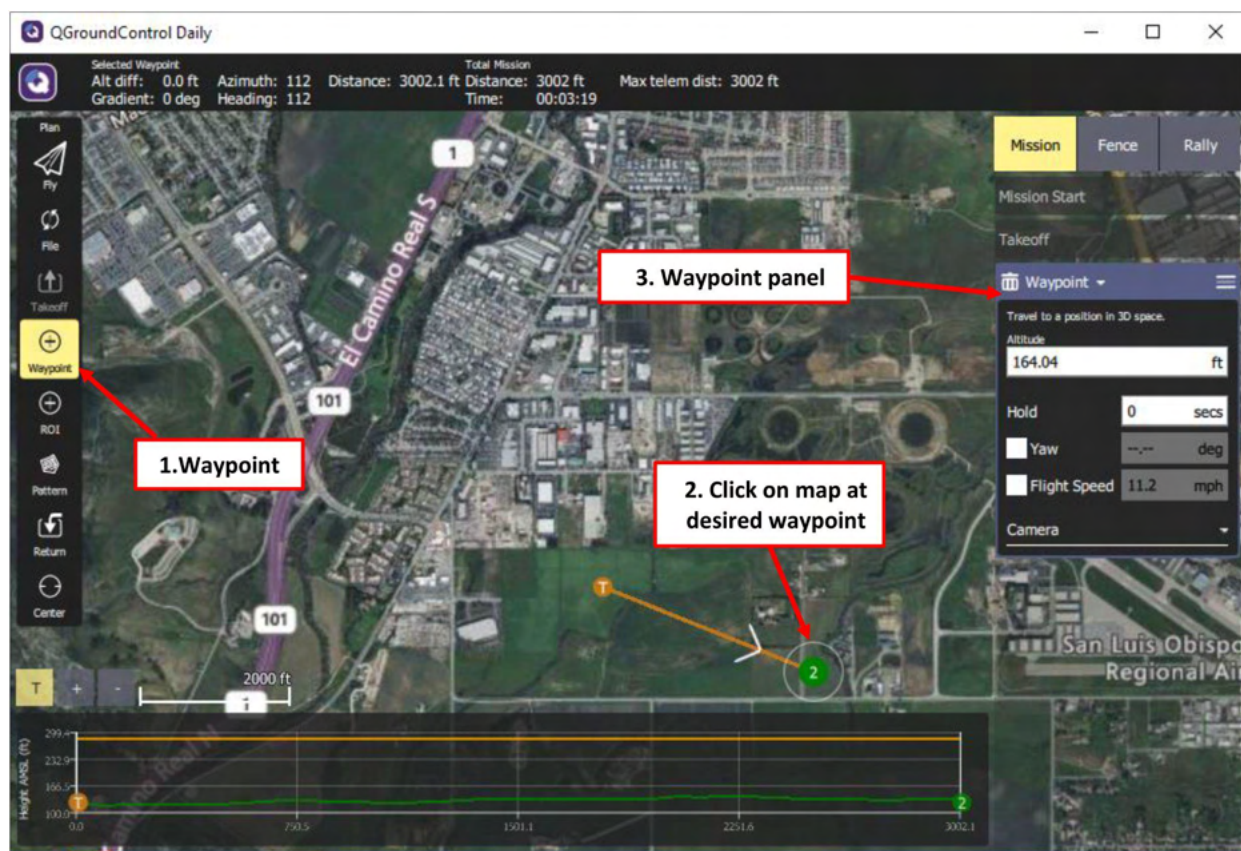


Figure 13. Adding Waypoints



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. <b>Note:</b> For more Return and other options, click on the down arrow next to <i>Return to Launch</i> (#3 below). This opens the <i>Basic Mission Command Editor</i> (see next page).
Continued next page	

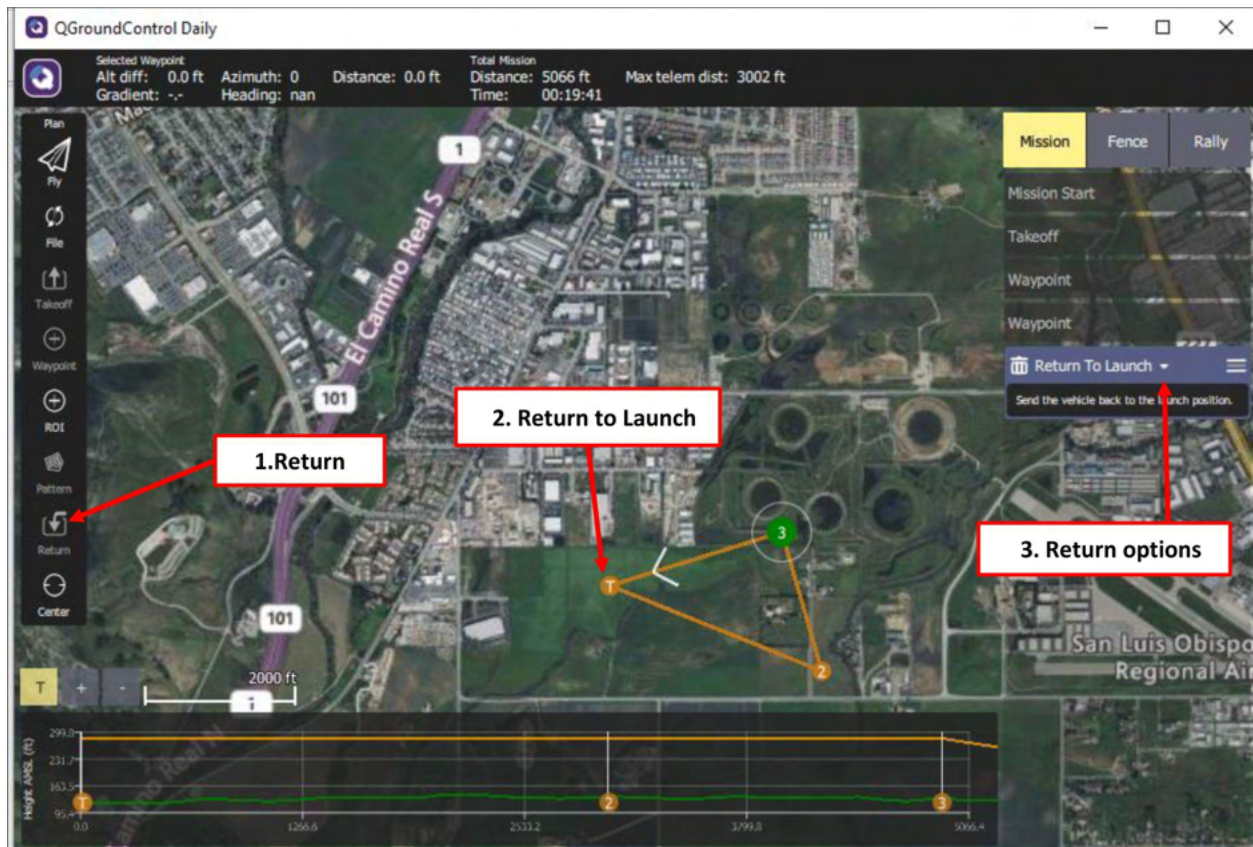


Figure 14. Add a Return

Step	Action
11	<p>The Basic Mission Command Editor (the left image in Figure 15) offers Return and other options.</p> <p><b>Note:</b> If you select the down arrow next to the Basic category (see Figure 15), it opens a dropdown menu (right side of Figure 15), that offers more Mission Command Editors.</p>
Continued next page	

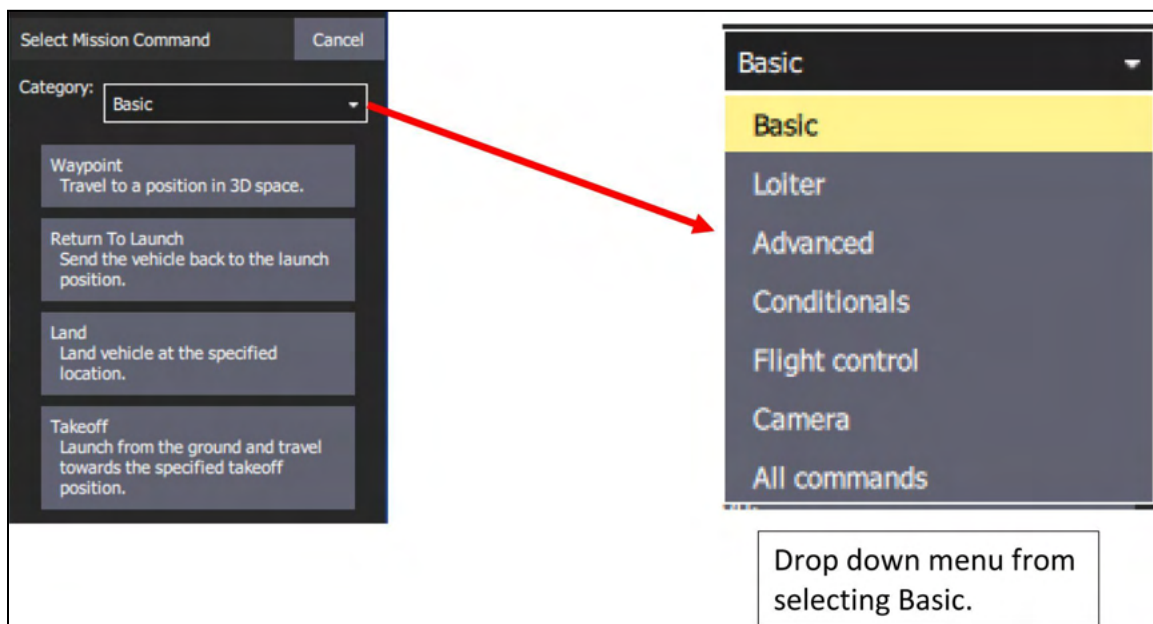


Figure 15. Basic Mission Command Editor

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 Figure 16 below).
NOTE	<p>Instructions for setting up a wireless connection between a HereLink and a GCS are available in the Appendix. There are two different ways to do this:</p> <ul style="list-style-type: none"> <li>• <a href="#">Using the Wireless Hotspot in the HereLink Hand Control</a></li> <li>• <a href="#">Connect HereLink and GCS Through a WiFi Network</a></li> </ul>
13	<p><b>Note:</b> The mission can be uploaded to the aircraft two ways: wirelessly; or via a physical connection. The following steps describe both ways.</p> <ol style="list-style-type: none"> <li>1. Power on the aircraft</li> <li>2. If you are uploading the mission wirelessly, proceed to Step 14.</li> <li>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.</li> </ol>
14	When you have completed planning the mission, an <i>Upload Required</i> icon in the upper-right corner of the screen flashes. Select it, and <i>Done</i> appears at the top of the screen if the upload was successful.
Continued next page	

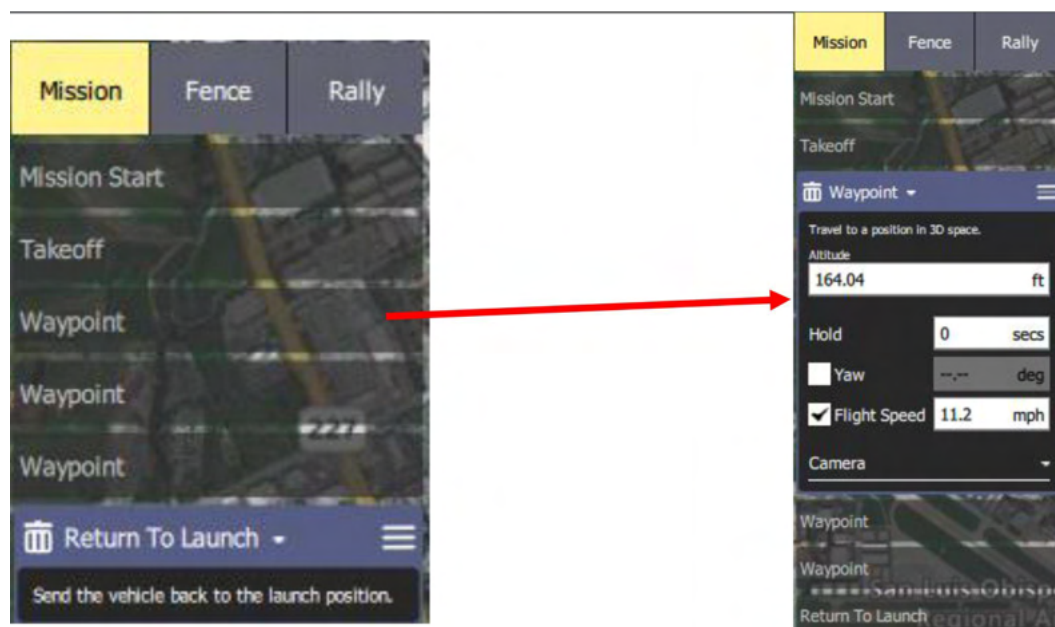


Figure 16. View Details About Mission Events

Step	Action
14	Select the Fly icon at the top of the Tools panel (see below), then select Takeoff.
End of Procedure	

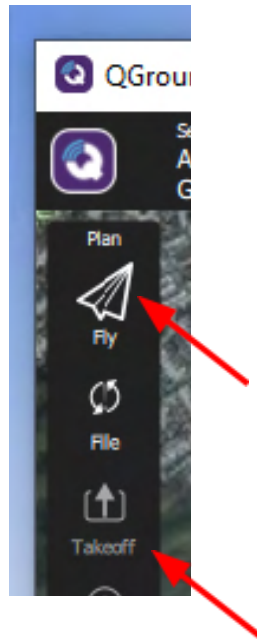


Figure 17. Fly and Takeoff

## Preflight Checklist

- ☐ All four arms are lifted and secured into place.
- ☐ The GPS mast is lifted and latched on both sides.
- ☐ The propellers are mounted in the proper locations and are secured tightly (be sure screwheads are flush).
- ☐ Check that the propellers rotate freely.
- ☐ The antenna(s) is(are) plugged into the top of the hand controller or telemetry unit.
- ☐ The batteries are plugged fully into the aircraft, and the balance plugs are secured under the battery strap.
- ☐ The aircraft battery level shown in QGC is above 50%.
- ☐ The ground station battery is above 50% charge.
- ☐ The ground control station (laptop or HereLink) is connected to the aircraft.
- ☐ The GPS indicator LED is flashing 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 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 on page 52.
- ☐ 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](#)

[Registering a Vehicle with the FAA](#)

[Critical Situations](#)

[Upgrading the Aircraft Firmware](#)

[Calibrate the Compass](#)

[Calibrate the Accelerometers](#)

[Wirelessly Connect a HereLink Hand Controller to a Ground Control Station](#)

[Using the Wireless Hotspot in the HereLink Hand Control](#)

[Connect HereLink and GCS Through a WiFi Network](#)



## Security Risks and Mitigations

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 vehicles 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.

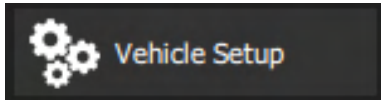
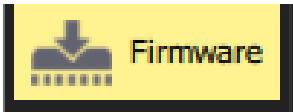
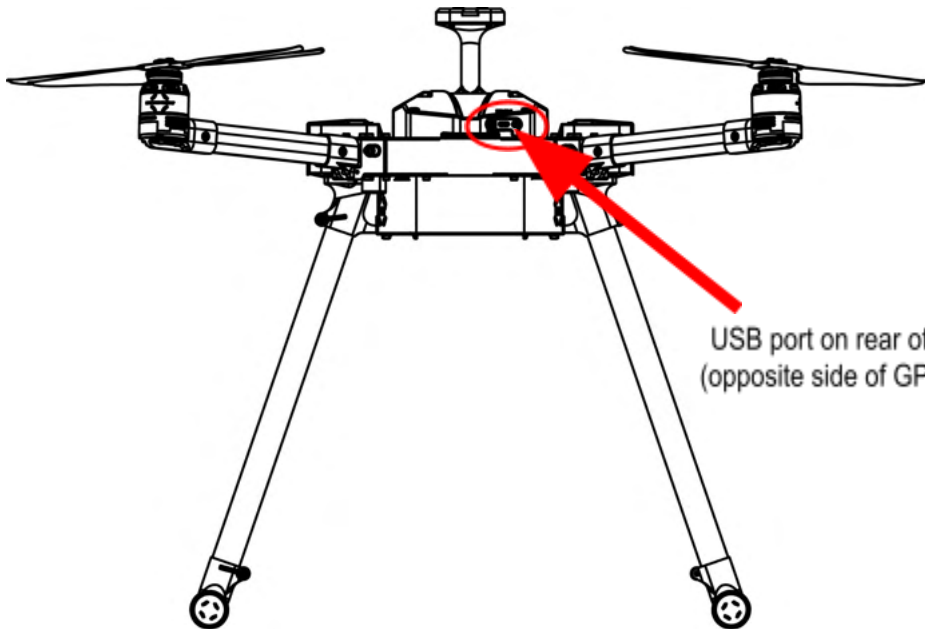
## Critical Situations

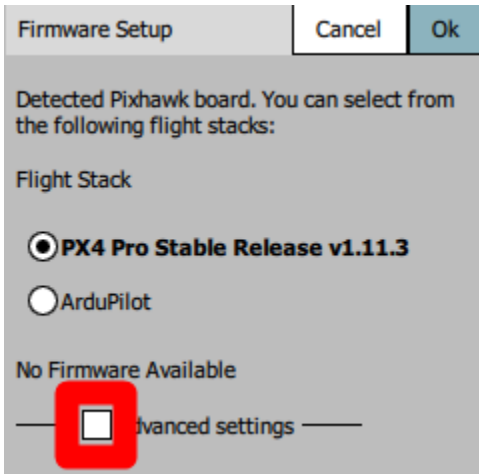
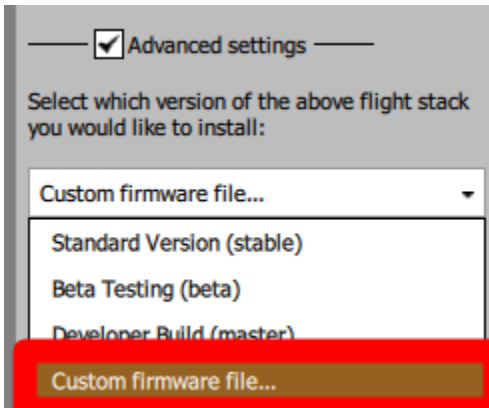
Below are some situations which require immediate action.

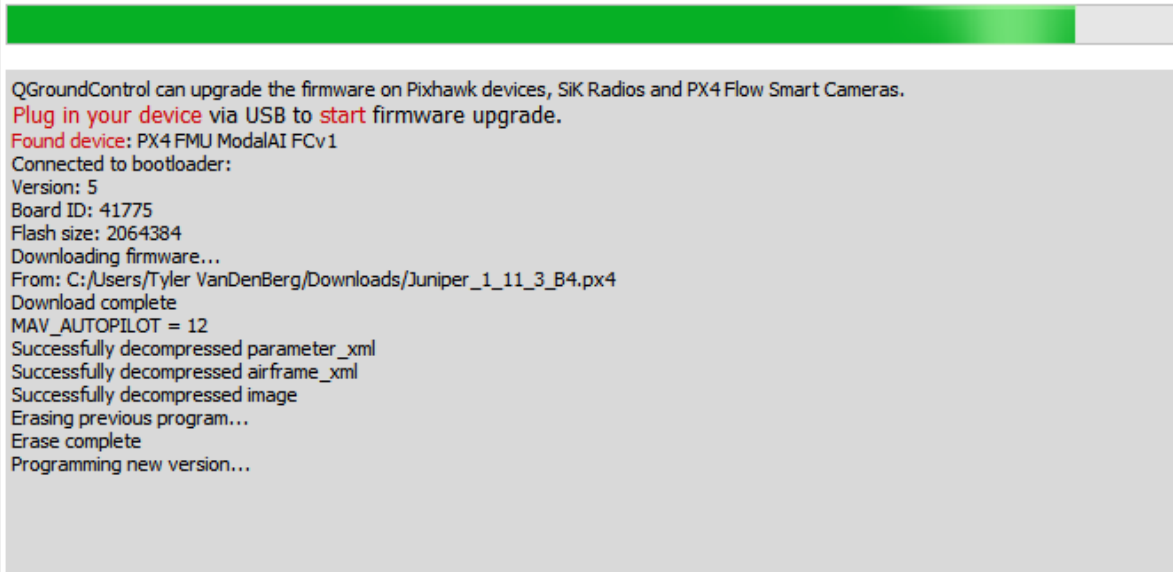
- **Battery Less than 15%:** If flying with a critical battery voltage, determine the trajectory of the aircraft and fly above open ground. The aircraft is now unstable and should be brought to the ground as quickly and safely as possible. If flying in an autonomous flight mode, it is recommended to switch the control to position mode to bring the aircraft 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.
- **Entire 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.
 <p>USB port on rear of aircraft (opposite side of GPS mast).</p>	
6	Power on the aircraft.
Continued next page	

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	

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.
<div><h3>Firmware Setup</h3><pre>QGroundControl can upgrade the firmware on Pixhawk devices, SIK Radios and PX4 Flow Smart Cameras. Plug in your device via USB to start firmware upgrade. Found device: PX4 FMU ModalAI FCv1 Connected to bootloader: Version: 5 Board ID: 41775 Flash size: 2064384 Downloading firmware... From: C:/Users/Tyler VanDenBerg/Downloads/Juniper_1_11_3_B4.px4 Download complete MAV_AUTOPILOT = 12 Successfully decompressed parameter_xml Successfully decompressed airframe_xml Successfully decompressed image Erasing previous program... Erase complete Programming new version...</pre></div>	
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.

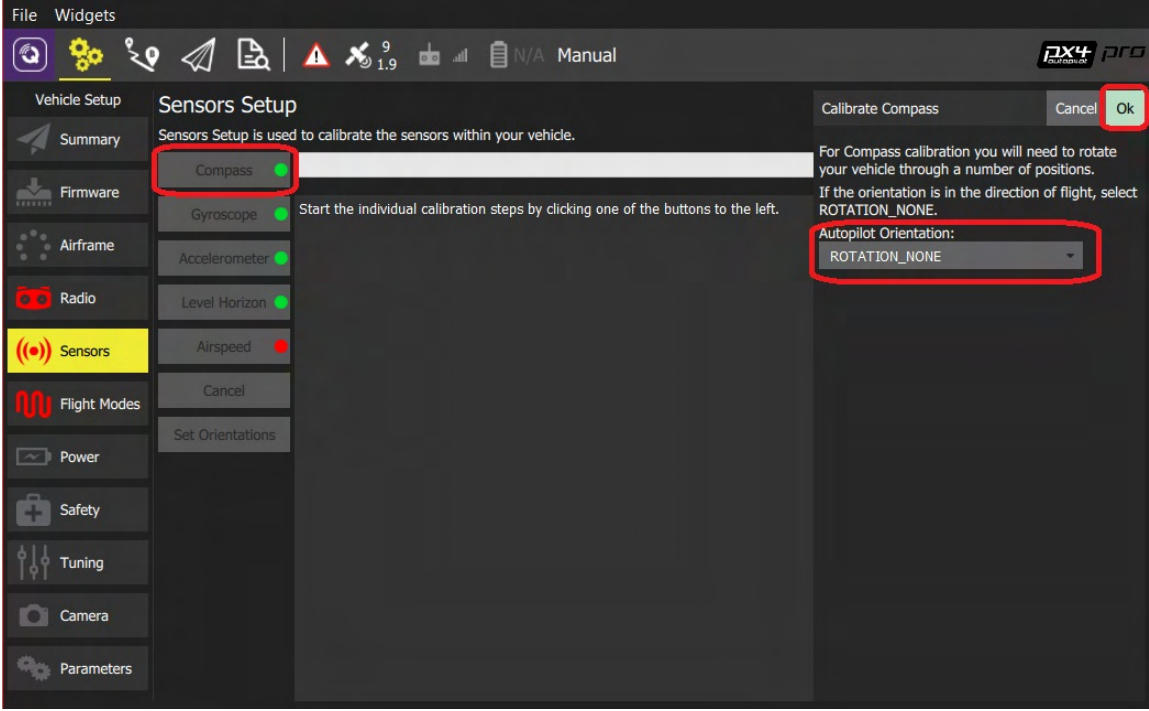
Compass calibration is done through the autopilot software in the aircraft. Complete instructions are available at the following link:

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

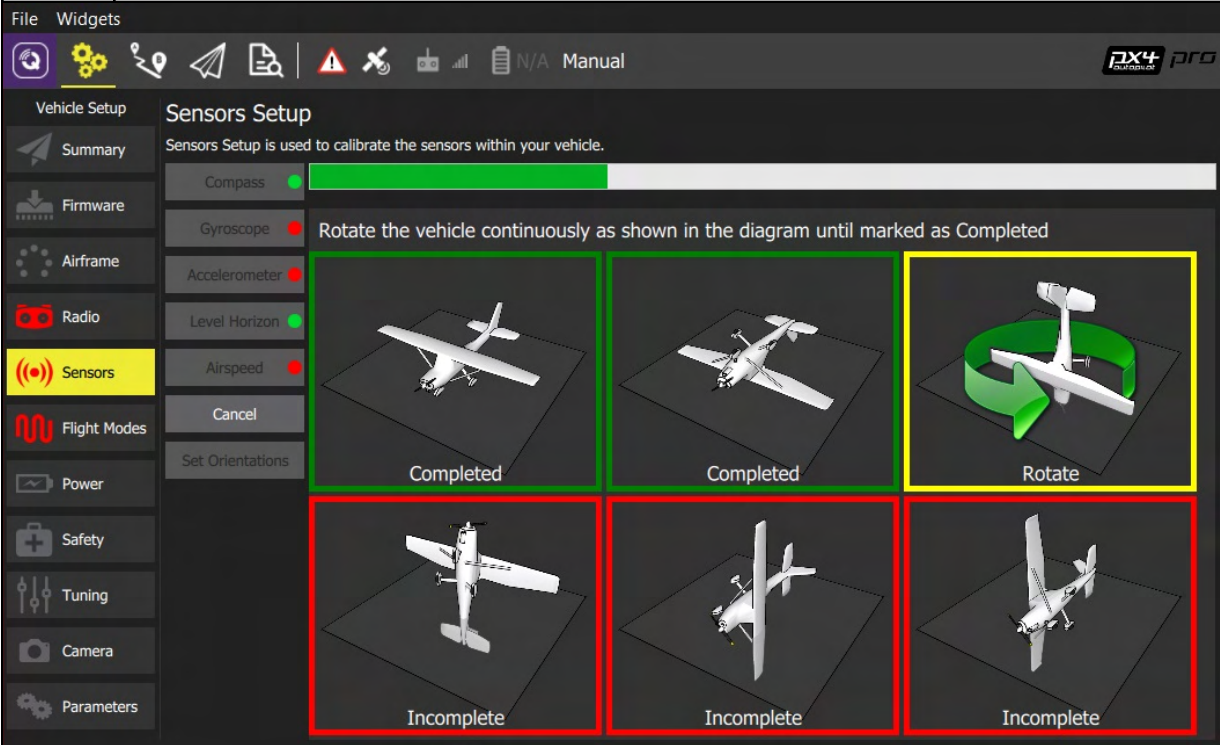
Indications that the compass may require calibration include:

- 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.
<b>NOTE</b>	Metal is not always obvious! Do not calibrate on top of an office table (which often contains metal bars) or next to an 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	

Step	Action
5	In QGC, select the Gear icon (aircraft 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	



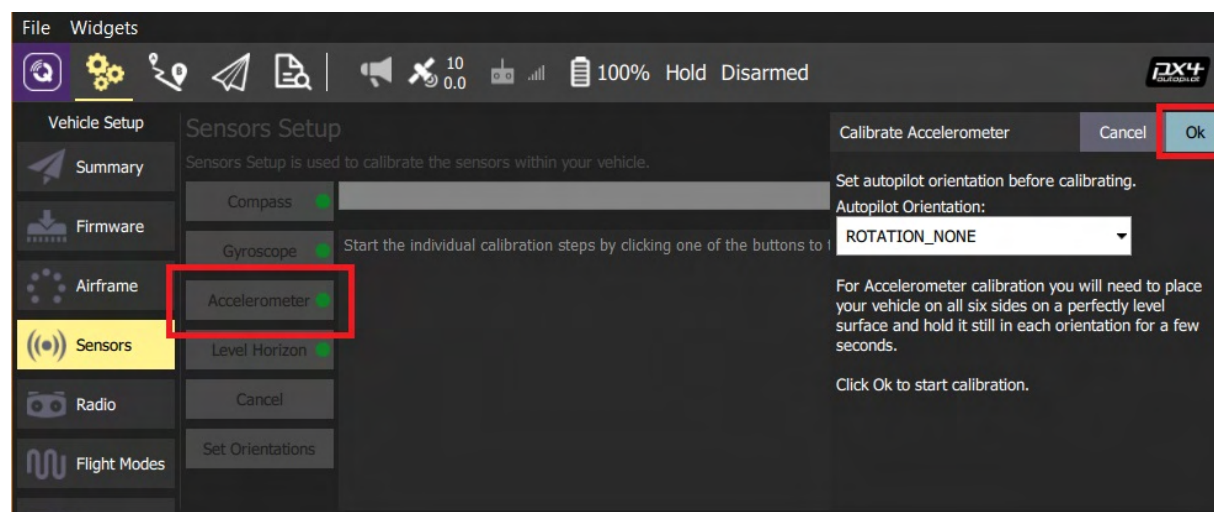
Step	Action
<b>NOTE</b>	The steps that follow are excerpted from the PX4 User Guide, and show a fixed-wing aircraft. The orientations apply to a rotary wing aircraft as well.
<b>8</b>	The display shown below appears. Orientations shown in red are “incomplete,” and must be calibrated. Orient the aircraft 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.
 <p>The screenshot shows the PX4 Sensors Setup interface. On the left is a sidebar with 'Vehicle Setup' options: Summary, Firmware, Airframe, Radio, Sensors (highlighted), Flight Modes, Power, Safety, Tuning, Camera, and Parameters. The main area is titled 'Sensors Setup' and includes a description: 'Sensors Setup is used to calibrate the sensors within your vehicle.' Below this is a list of sensors with status indicators: Compass (green), Gyroscope (red), Accelerometer (red), Level Horizon (green), Airspeed (red), and a 'Cancel' button. The main display area shows six aircraft orientation diagrams in a 2x3 grid. The top row shows 'Completed' (green border), 'Completed' (green border), and 'Rotate' (yellow border). The bottom row shows three 'Incomplete' (red border) orientations. A green arrow indicates the rotation direction for the 'Rotate' orientation.</p>	
<b>9</b>	Repeat the calibration for all aircraft orientations until all orientations have a green border.
<b>10</b>	Reboot the aircraft prior to flight.
<b>End of Procedure</b>	

## 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:

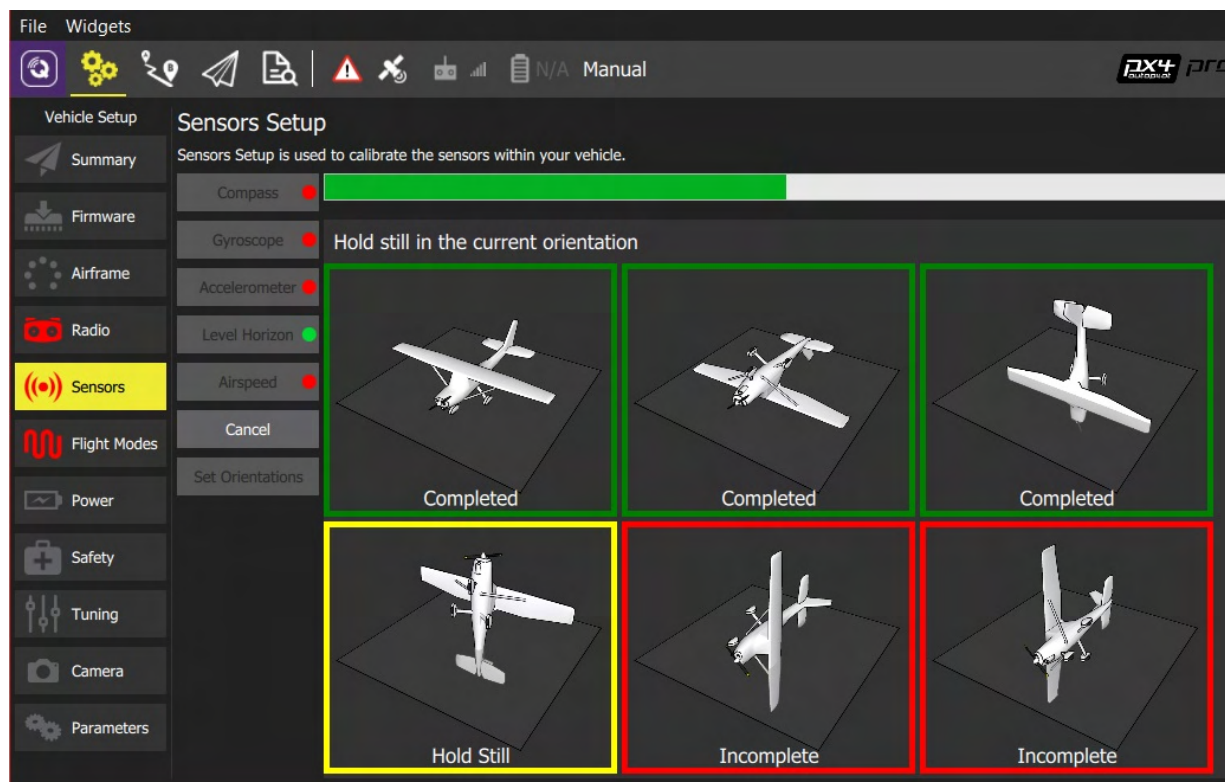
<https://docs.px4.io/v1.9.0/en/config/accelerometer.html>

Step	Action
1	Start QGroundControl and connect it to the aircraft.
2	Select the Gear icon (aircraft Setup) in the top toolbar and then Sensors in the sidebar (see figure 18 below).
3	Click the Accelerometer sensor button.
<b>NOTE</b>	The Accelerometer Orientation is set with the autopilot parameter file and should not be changed during calibration.
<b>Continued next page</b>	



**Figure 18. Select the Accelerometer**

Step	Action
4	Click OK to start the calibration.
5	Position the aircraft as shown by the images on the screen (see Figure 19 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. <b>Note:</b> If you are not calibrating any more sensors, reboot the aircraft before flight.
End of Procedure	



**Figure 19. Aircraft Orientations for Accelerometer Calibration**

## Wirelessly Connect a HereLink Hand Controller to a Ground Control Station

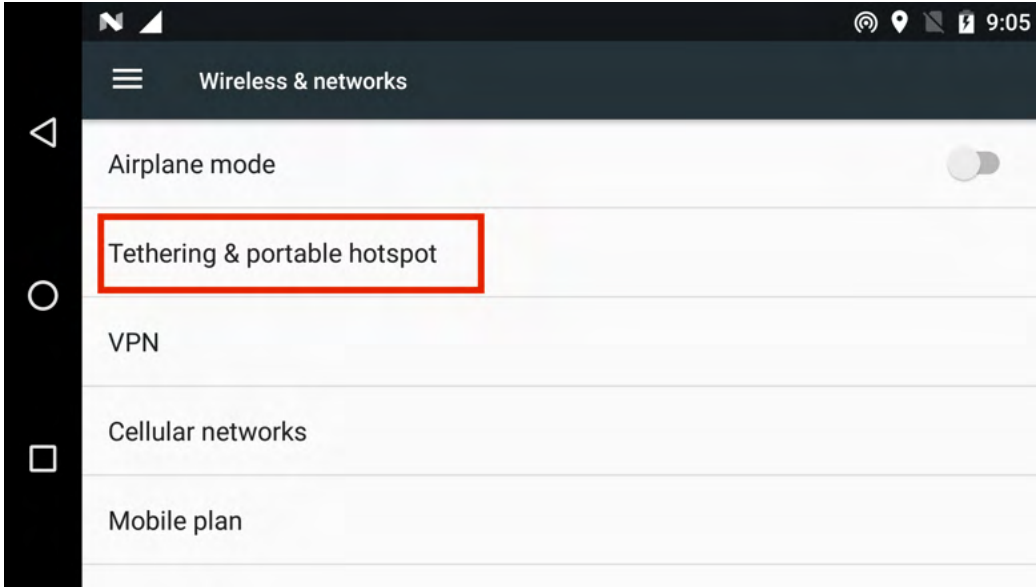
There are situations where you need to wirelessly connect a hand controller, (in this case, a HereLink Blue or Black), to a Ground Control Station (GCS). The GCS is typically a laptop or tablet that has QGroundControl flight software installed.

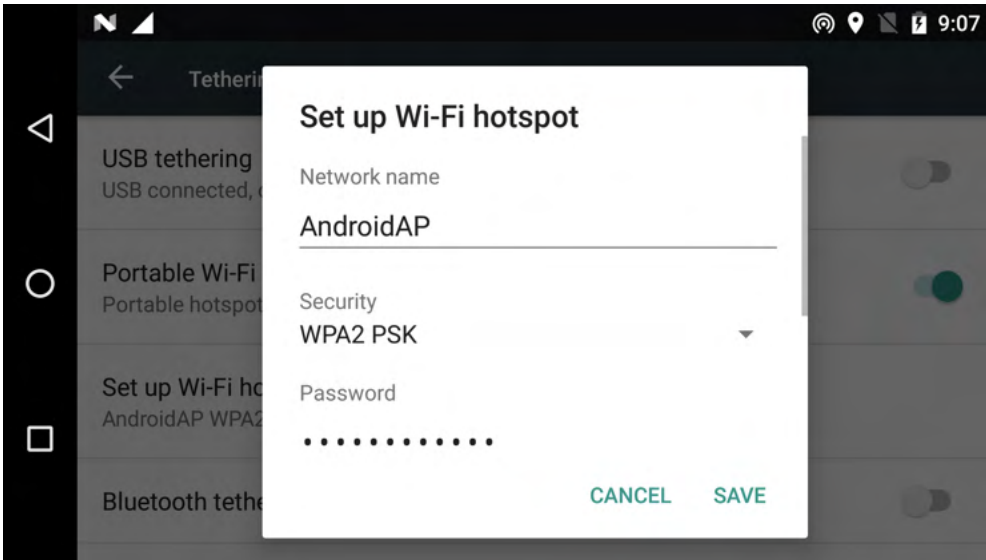
There are two ways to establish a wireless connection between a HereLink and GCS. Below are links that take you to the procedure.

- [Using the Wireless Hotspot in the HereLink Hand Control](#)
- [Connect HereLink and GCS Through a WiFi Network](#)

**Note:** In order to confirm the wireless connection between the HereLink and GCS, power on the aircraft before performing either of the following procedures.

## Using the Wireless Hotspot in the HereLink Hand Control

Using the Wireless Hotspot in the HereLink Hand Control	
Step	Action
1	On the Herelink, go to Settings->More->Tethering & portable hotspot (see below).
	
Continued next page	

Using the Wireless Hotspot in the HereLink Hand Control	
Step	Action
2	Enable Portable WiFi hotspot (the button on the right side of the screen). A Set up Wi-Fi hotspot dialog window appears (see below).
	
3	Note the Network name and Security information in the dialog window (see above).
4	On the device (tablet or laptop) where GCS is installed, open the Network and Internet settings, and connect the device to the HereLink hotspot.
End of Procedure	


## Connect HereLink and GCS Through a WiFi Network

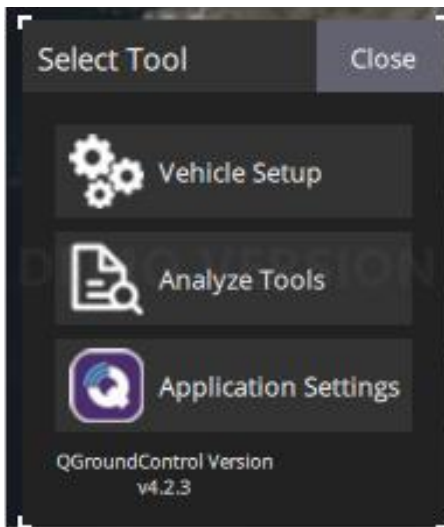
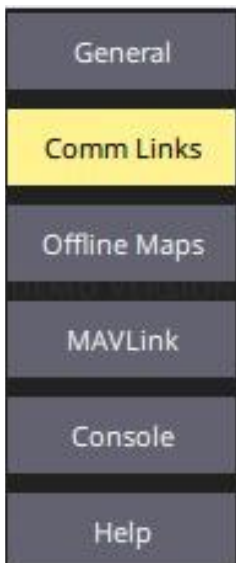
The following procedure describes how to wirelessly connect the GCS to a HereLink through a local WiFi network.

**Note 1:** The HereLink uses an Android operating system. The instructions below reflect this.

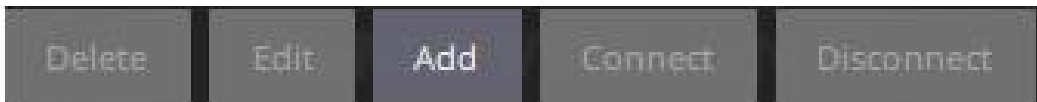
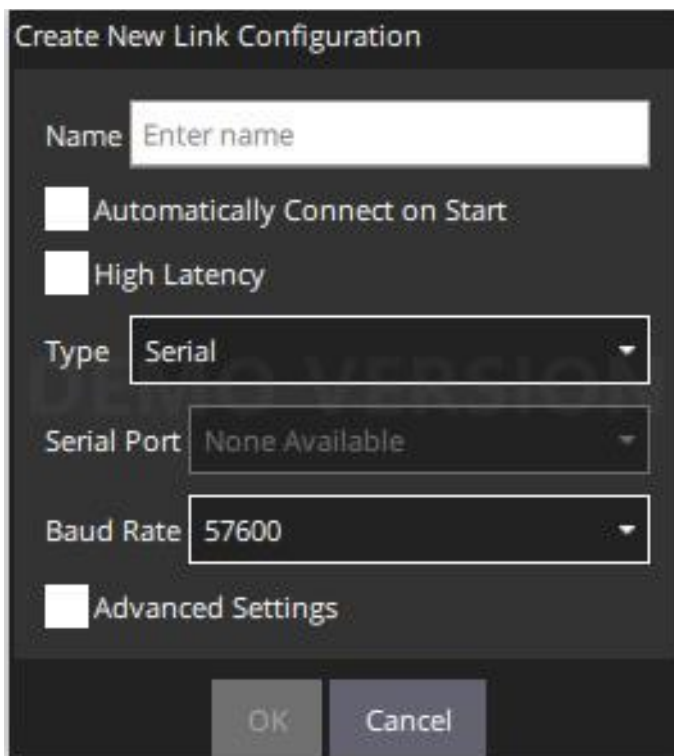
**Note 2:** Before performing the following procedure, connect the device on which QGC is installed (tablet or laptop), to the WiFi network that the HereLink will be connected to.

**Note 3:** In order to confirm the wireless connection between the HereLink and GCS, power on the aircraft before performing the following procedure.

Connect HereLink and GCS through a WiFi Network	
Step	Action
1	On the Herelink, go to the Settings -> About phone -> Status information -> IP address. Write down the IP address of the HereLink.
2	On the Herelink, go to Settings -> Connections -> WiFi, and connect the HereLink to a local WiFi network.
3	On the GCS, open QGroundControl (QGC).
4	locate the QGroundControl icon in the upper-left corner of the screen (see below). Select (click) this icon to open the Select Tool window (see next page).
	
Continued next page.	

Connect HereLink and GCS through a WiFi Network	
Step	Action
5	In the Select Tool menu (see below), click on Application Settings.
	
6	A selection menu opens in the upper-left corner of the screen (see below). Select Comm Links.
	
Continued next page	



Connect HereLink and GCS through a WiFi Network	
Step	Action
7	A selection menu appears at the bottom of the window (see below). Select Add.
	
8	A dialog box, Create New Link Configuration, appears (see below).
	
Continued next page	

HereLink and GCS through a WiFi Network	
Step	Action
9	Enter a name for the Comm Link (see below). In this example, the name we created is "IF750_WiFi."
10	Select Automatically Connect on Start.
11	In the Type field, select UDP.
12	In the Port field, set the value to 14552.
13	In the Server Addresses (Optional) field, enter the IP address of the Herelink (see Step 1).
14	Click on OK at the bottom of the dialog box.

**Continued next page**

HereLink and GCS through a WiFi Network	
Step	Action
<b>15</b>	The Create New Link Configuration dialog box closes, and the new Comm Link name that you created (IF750_WiFi) appears at the top of the screen.
<b>16</b>	To connect the GCS to the HereLink, select the new Comm Link to the HereLink (IF750_WiFi), at the top of the screen, then click on Connect at the bottom of the screen.
<b>17</b>	Once the aircraft and HereLink are wirelessly connected, the GCS begins issuing audible signals. This may take a few moments.
<b>End of Procedure</b>	

# IF750 Maintenance Schedule

Recommended Maintenance Activities	Maintenance Intervals (Every X Flights)							
	Every 1 Flight	10 Flights	25 Flights	50 Flights	100 Flights	200 Flights	400 Flights	800 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:								
Batteries						X		
Propellers							X	
Motors								X

## Maintenance Assumptions

1. For the maintenance schedule above, flights are assumed to be 30 minutes in length.
2. All maintenance described in this schedule designed to be user-serviceable
3. Proper care of aircraft is taken during flight and in storage.

## Maintenance & Spares Cost

1. Battery Replacement - \$300/pair
  2. 17" Propeller Replacement - \$150 per pair
  4. Landing Gear Replacement - \$650 per Leg
  5. GPS Antenna Mount Replacement - \$300
  6. Motor Replacement - \$200 each
- Estimated Total Maintenance cost per 800 flights (400 hours) - IF750: \$1700

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

## Revisions

Revision Number	Changes
3.01	<ul style="list-style-type: none"><li>• Calibrate the Compass, page 53, added step: "Reboot the aircraft prior to flight."</li><li>• Added Maintenance Schedule after Appendix</li><li>• Added Revisions table at end of this document</li></ul>
3.02	<ul style="list-style-type: none"><li>• Added section to Appendix: Security Risks and Mitigation</li><li>• Replaced graphic on p. 49 with correct one (original graphic showed IF1200; replaced with graphic of IF750)</li></ul>
3.03	<ul style="list-style-type: none"><li>• Section, Power On the Aircraft, Step 2: corrected GPS LED meanings</li><li>• Add topic to Appendix: Wirelessly Connect Hand Controller to Ground Control Station</li><li>• Install the Batteries in the Aircraft: added text and photo describing how to secure balance plugs under Velcro straps.</li><li>• Safety Information, Notes, and References: added text describing links in the document.</li></ul>