SOFTWARE
OPERATIONS MANUAL

WISPr OS

User Manual v1.0.7

September 27, 2019

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Notice

All instructions and documents are subject to change at the sole discretion of Autonomous Industrial Solutions. For up to date product information, visit www.wisprsystems.com and go to the support page

⚠ WARNING Read the entire user manual to become familiar with the operation and features of this product before use. Failure to operate the product as directed can result in damage to the product, cause damage to personal property and cause serious injury. This is a sophisticated and technical product. It must be operated with caution and good judgement and requires some basic mechanical aptitude. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or other property. This product is not intended for use by children or persons under the age of 18. Be sure to only use genuine WISPr Systems components. Do not alter this product in any way outside of the documents provided by WISPr Systems. These safety guidelines contain instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the user manual, prior to assembly, setup or use, in order to operate the product correctly and avoid damage or serious injury.

Pre-Flight Checklist:

Ensure that you have your FAA Part 107 License
Be familiar with FAA Part 107 rules and regulations
Ensure your aircraft is registered with the FAA
Ensure weather conditions are suitable for flight
Ensure that you are NOT under the influence of alcohol, drugs, or any medications that could impair your abilities to operate the UAV safely
Ensure that you are using only genuine WISPr Systems parts and that all the parts are free from damage or broken components.
Ensure the Remote, Battery, and mobile devices are fully charged
Ensure propellers are mounted correctly and confirm the propeller attachment is secured to the motor attachment.
Ensure you are flying OUTSIDE of restricted areas and No Fly Zones
Ensure that you are operating within local and federal laws and regulations
Ensure that you have obtained any appropriate authorizations
Be aware of your surroundings and understand the risks associated with operating UAV
Be familiar with the WISPr Systems User Manual

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Safety Regulations

General

DO NOT store the WISPr System's drones near any electromagnetic or magnetic fields, heavy machinery, large electric motors, high voltage sources, server rooms, sound equipment, laptops, batteries, or any other sources of interference.
You should not be under the influence of drugs, alcohol, or any medications that could impair your ability to operate the UAV safely.
Never use the WISPr System's drones for illegal operations.
Always have a flight plan.
DO NOT fly near or within a no-fly zone.
DO NOT fly above authorized altitude.
DO NOT fly aircraft out of your line of site.
Maintain contact with controller for entire flight.
Become familiar with operating drone and its controls before using the WISPr System's drones.
Never fly near or interfere with manned aircraft operations.
Always follow local and federal regulations.
Please Read entire user manual to become familiar with the features of this product before operating.
Failure to operate the product correctly and responsibly can result in damage to the product or personal property and cause serious injury.
The WISPr System's drones must be operated with caution and common sense and requires some basic mechanical ability.
This product is not intended for use by children and should never be used near children or pets/animals.
DO NOT alter product in any way.
Use only provided genuine WISPr Systems products.
Read manual prior to assembly and/or use.
The WISPr Systems' drones is not a toy and should only be used for its specified purposes.

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Manual Use:

Legend

Tips

Warning

Important

Read Before Use:

Unpacking the WISPr Pogo
WISPr Pogo Operational Manual
FAA Regulations - https://www.faa.gov/uas/commercial_operators/become_a_drone_pilot/

Watch Before Use:

All the following videos can be found at: https://wisprsystems.com/support/

Configuring CPE to connect to the WISPr OS
POGO Pre/Post Flight Procedures
WISPr OS Failsafes
WISPr OS control options and tutorial
Calibration Tutorial

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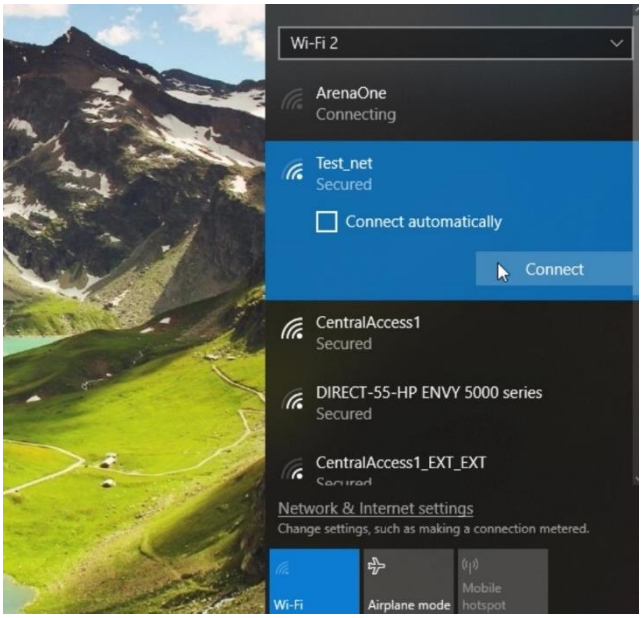
Connect to Drone Wi-Fi Access point

If using a laptop connect a usb dongle for extended range while flying. Insert USB of the wireless dongle into the laptop before attempting to connect to Wi-Fi network. Failure to do this could result in a mid-flight connection loss.
The dongle is dual band 2.4GHz and 5GHz to allow the user to be able to connect to 2.4GHz or 5GHz Pogo access point. The dongle also increases the distance in which the Pogo can fly away from the signal source. A geofence of 200 feet altitude ceiling and a 300 feet radius from the takeoff location.

Otherwise just connect user device (Laptop, Tablet or Smartphone) to Pogo Access Point. Name of Wi-Fi network will vary between each WISPr Pogo and the Wi-Fi network name and password will be given to the user with the purchase of the WISPr Pogo. Make sure to use the Wi-Fi dongle by selecting the "Wi-Fi 2", when selecting the Wi-Fi card to use to connect to the WISPr Pogo Wi-Fi network. For demonstration purposes we use "Test_net" as our Wi-Fi network to connect to.



💡	Using a dongle from WISPr Systems will allow the user to broadcast to the drone using 2.4GHz and 5.8GHz Using a Wi-Fi dongle will decrease the chance of a connection loss midflight.
⚠	If the Drone's SSID is not visible, restart the Drone and try again. If the Wi-Fi is not visible, a recent change to the broadcast frequency may have been made. After the change, only a computer with a Wi-Fi IC that works with 5.8GHz will be able to view it

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Using WISPr OS

Configure your CPE Antenna

- **CPE ANTENNA'S LAN PORT MUST BE CONFIGURED TO 192.168.1.20 TO WORK WITH THE WISPR POGO.**
- **FOR SIMPLICITY IT IS BEST TO SET YOUR CPE ANTENNA'S CHANNEL WIDTH TO AUTO SELECT.**

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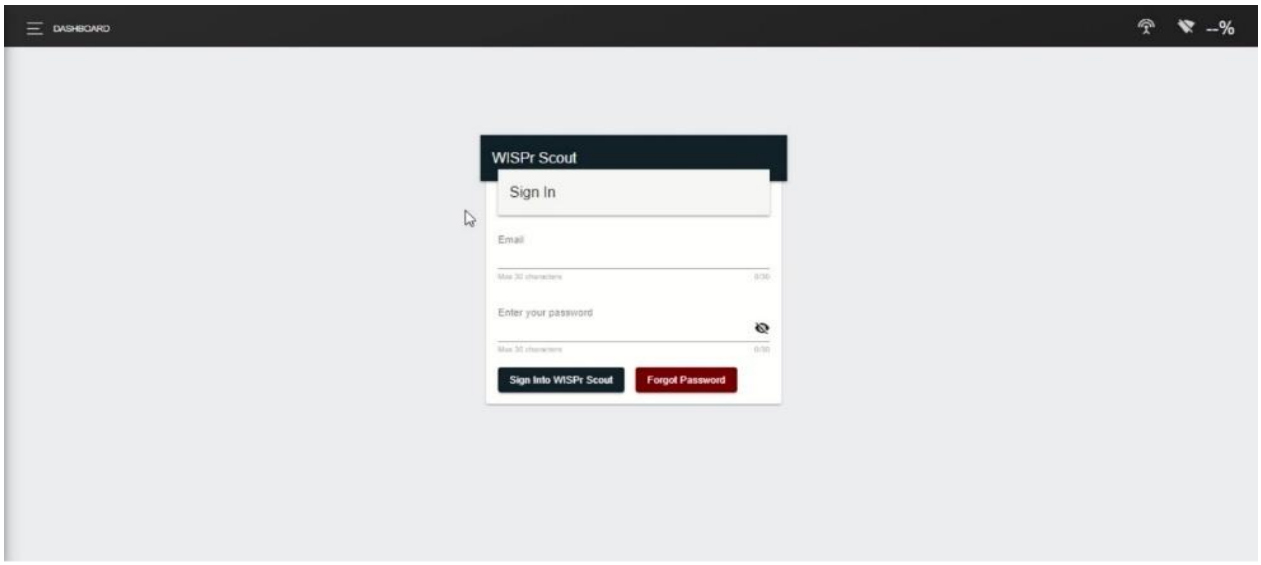
Login to WISPr OS

Once the user is connected to the WISPr Drone access point, open up a web browser (Chrome, Firefox, etc.) and go to the address, 172.16.1.1:4201 and a login page will appear. Use the login credentials used to create an account when purchasing the WISPr Drone to log into the WISPr OS.



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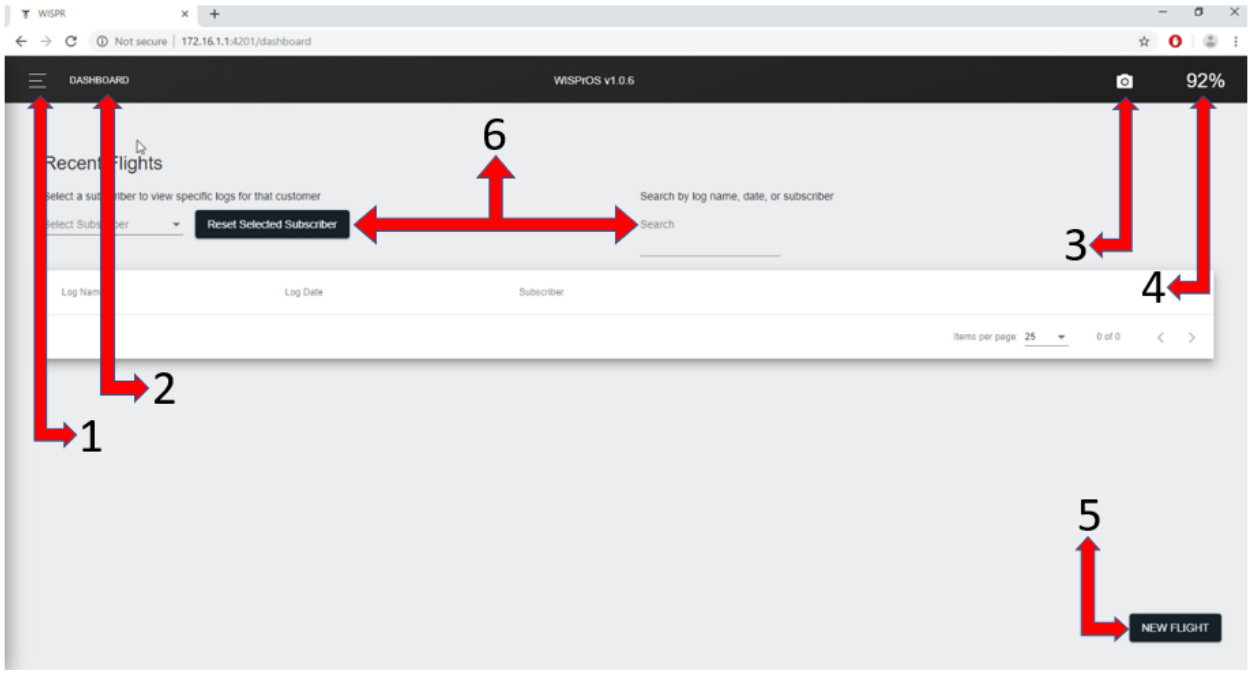
Dashboard

1. Main Menu button – opens main menu
2. Dashboard button – returns to dashboard
3. Picture Button – when clicked a picture will be taken
4. Battery Percentage display icon – displays the battery percentage.
5. New Flight button – click button to begin new flight
6. Previous Flight Logs – search through flight logs



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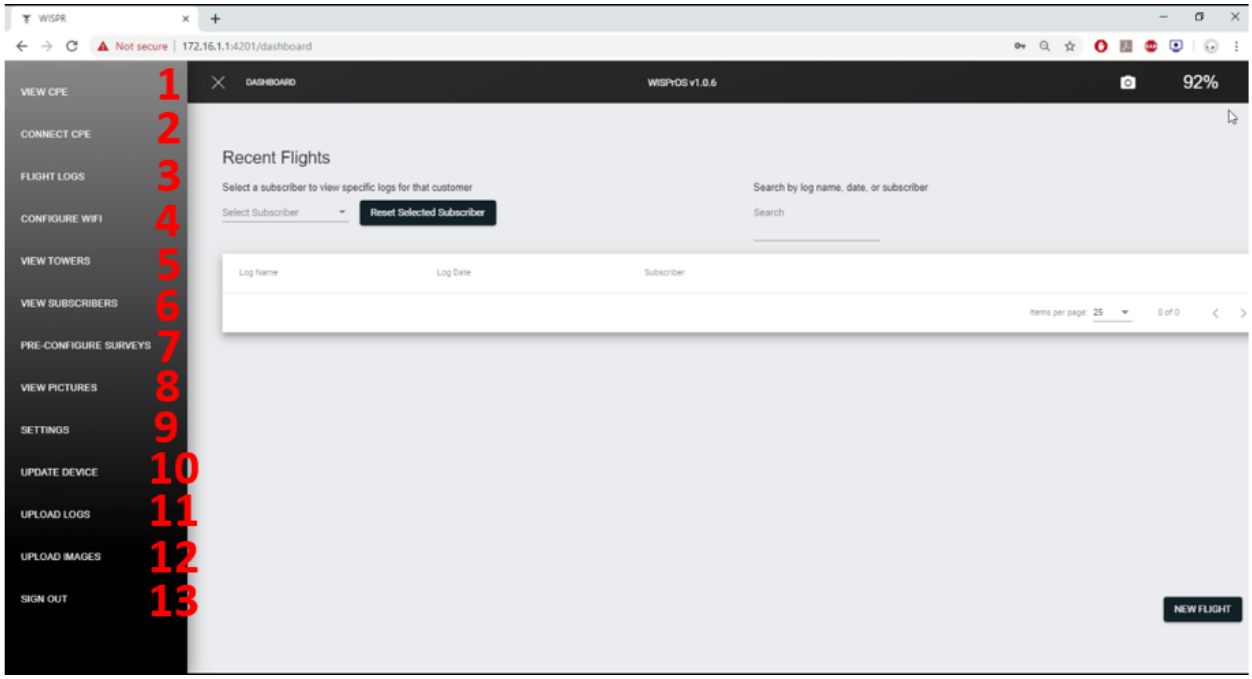
Main Menu

1. View CPE – click to log directly into the CPE antenna used on the drone.
2. Connect CPE – connects your CPE software to the WISPr OS.
3. Flight Logs – Review old New Tower Survey Logs.
4. Configure Wi-Fi – Connect to Wi-Fi to update, download and upload logs to the WISPr Cloud.
5. View Towers – View what towers have been downloaded from the WISPr Cloud.
6. View Subscribers – View what subscribers are available.
7. Pre-configure Surveys – Pre-configure In-flight controls for quicker execution in flight.
8. View Pictures – View pictures that were taken during flight.
9. Settings – Change the access point frequency from 2.4GHz to 5GHz and vice versa or reboot drone.
10. Update Device – Update the WISPr OS software
11. Upload Logs – Upload logs to the WISPr Cloud, this also allows the drone to receive tower coordinates inputted into the cloud.
12. Upload Images – Manually upload pictures to cloud.
13. Sign-out – Sign out of drone.



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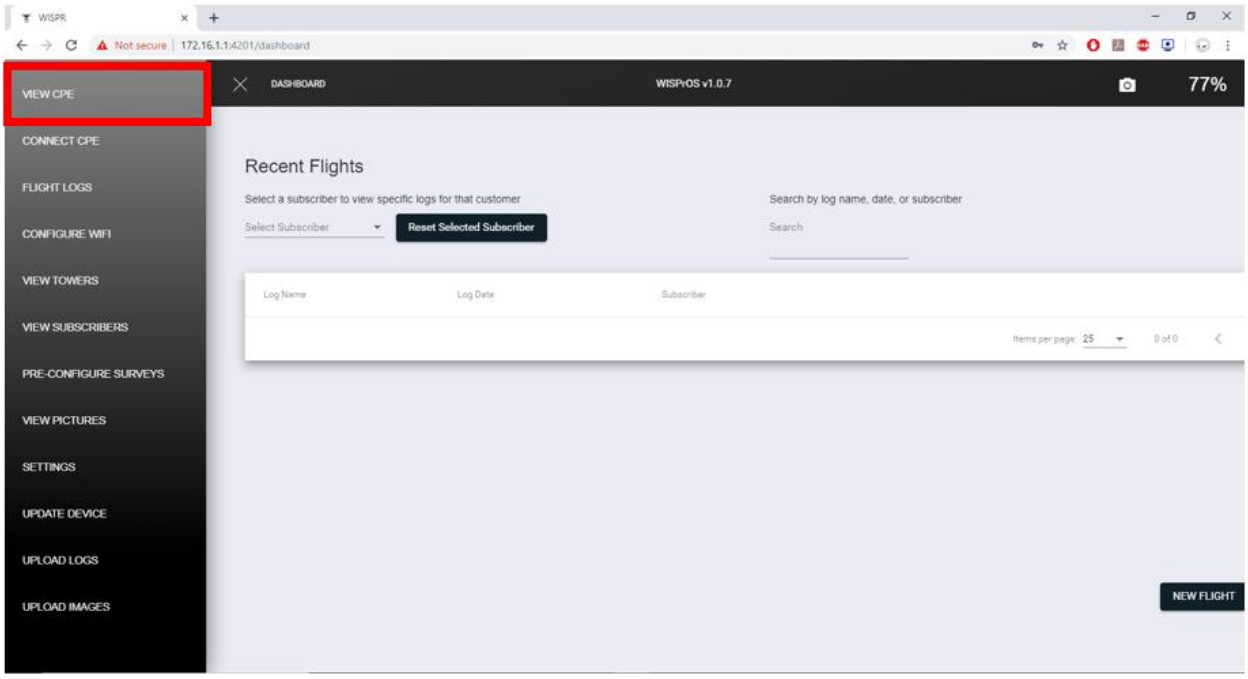
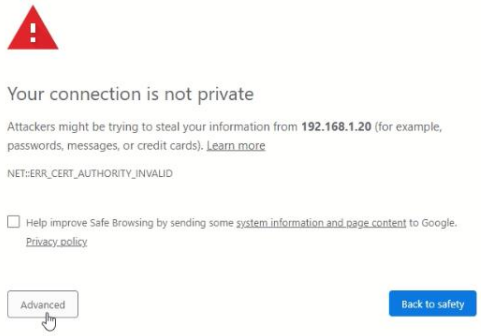
View CPE

To quickly open your CPE operating system, click ‘View CPE’ in the main menu.



This will take you to your CPE software login.



⚠ While you are viewing your CPE operating system you will not have control of your drone, simply click back over to the WISPr OS to regain controls.

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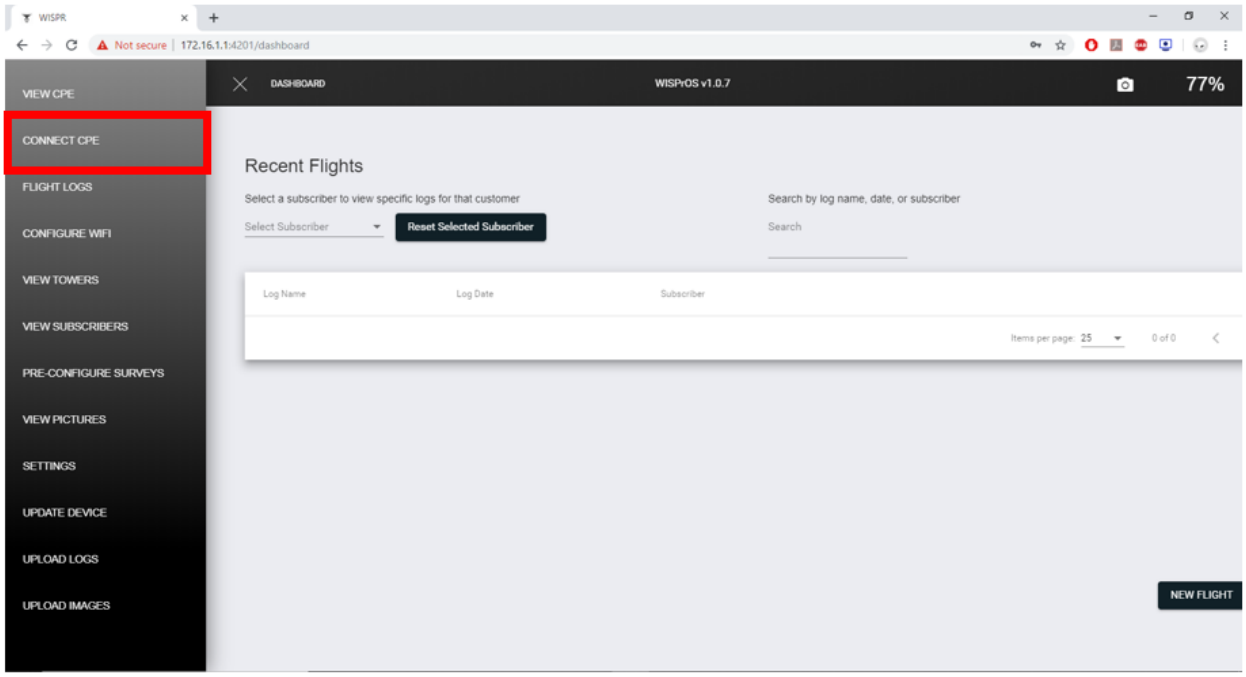
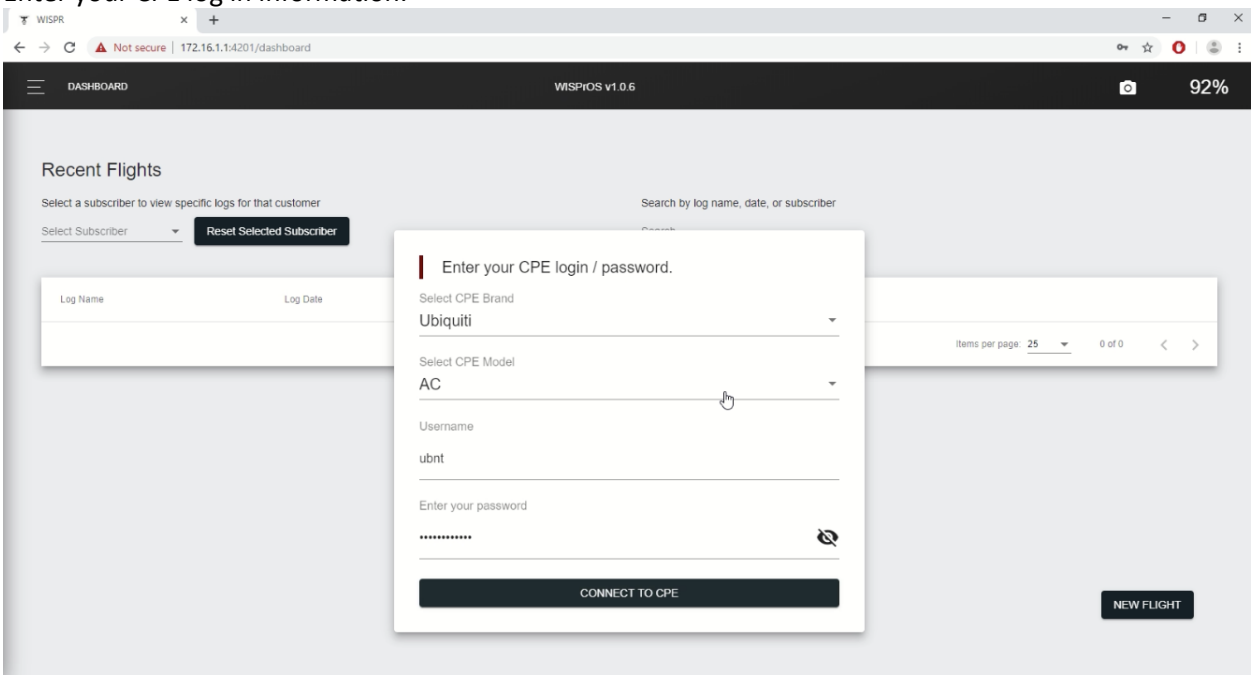
Connect CPE

To use the WISPr OS autonomous surveys, you must first connect your CPE to the WISPr OS. To do so click 'Connect CPE' in the main menu.



After selecting Connect CPE a pop-up window will appear that ask the user to select antenna brand, CPE model, username and password.

Enter your CPE log in information.



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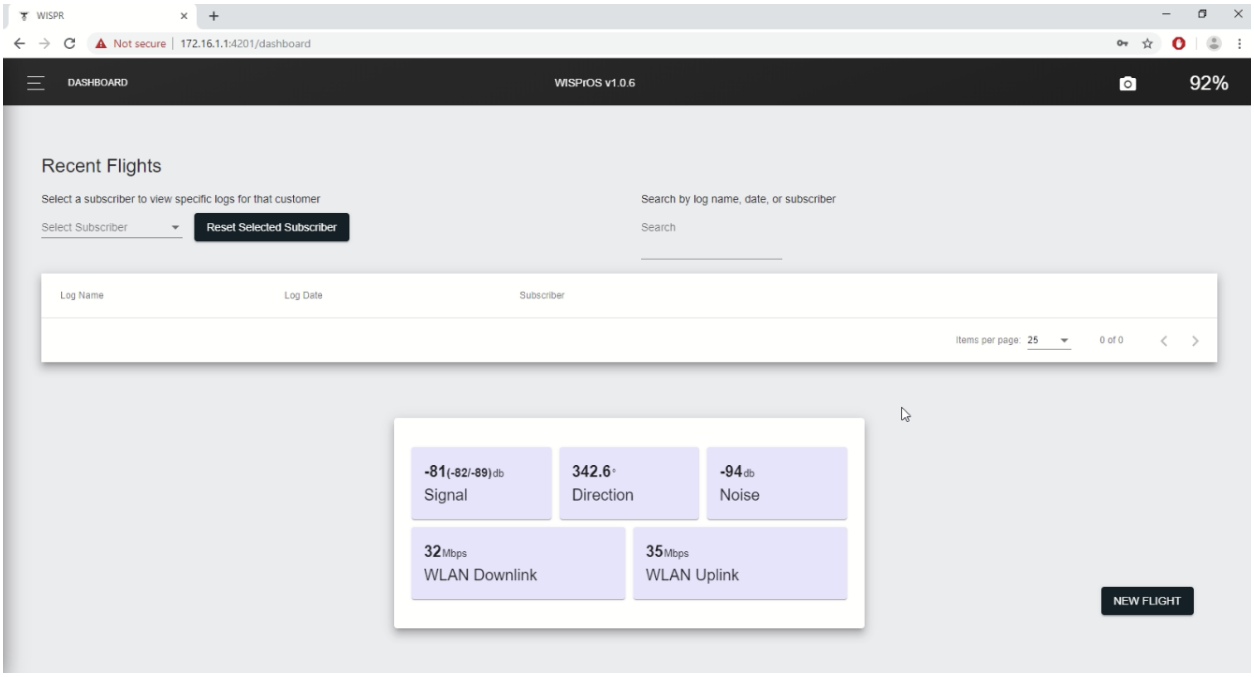
After the CPE is connected to the WISPr OS, data from the CPE will be shown in a pop-up. At this point the CPE is connected to the WISPr OS.



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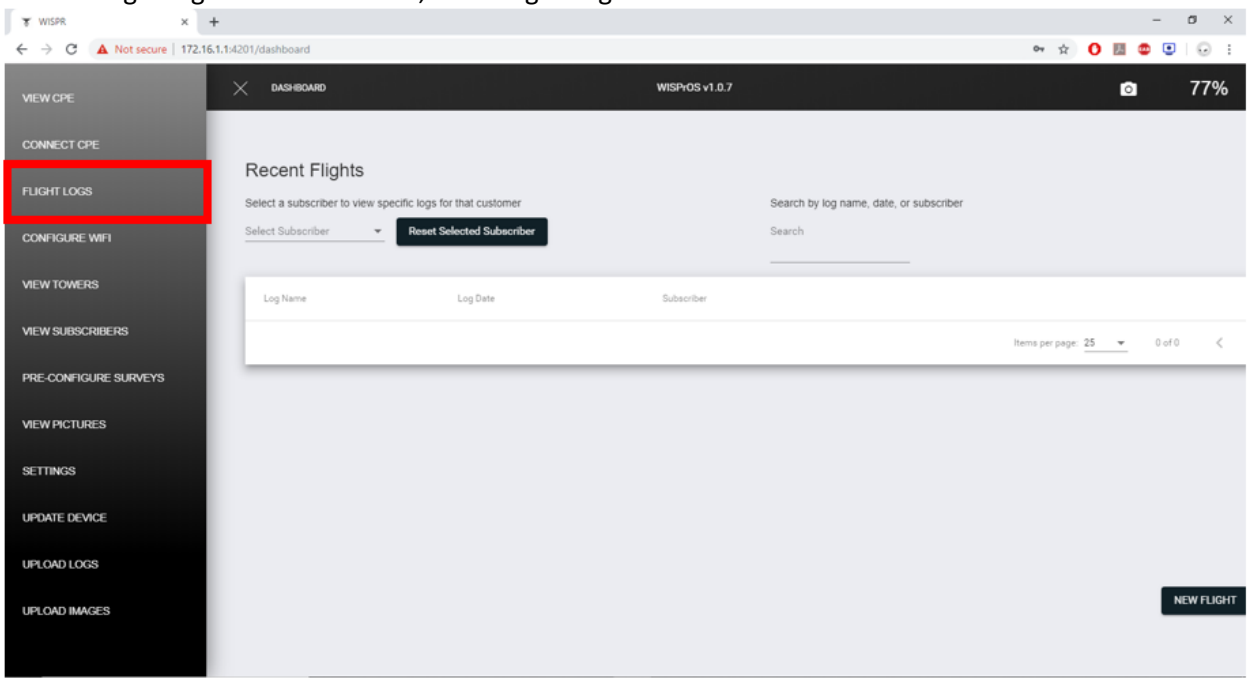
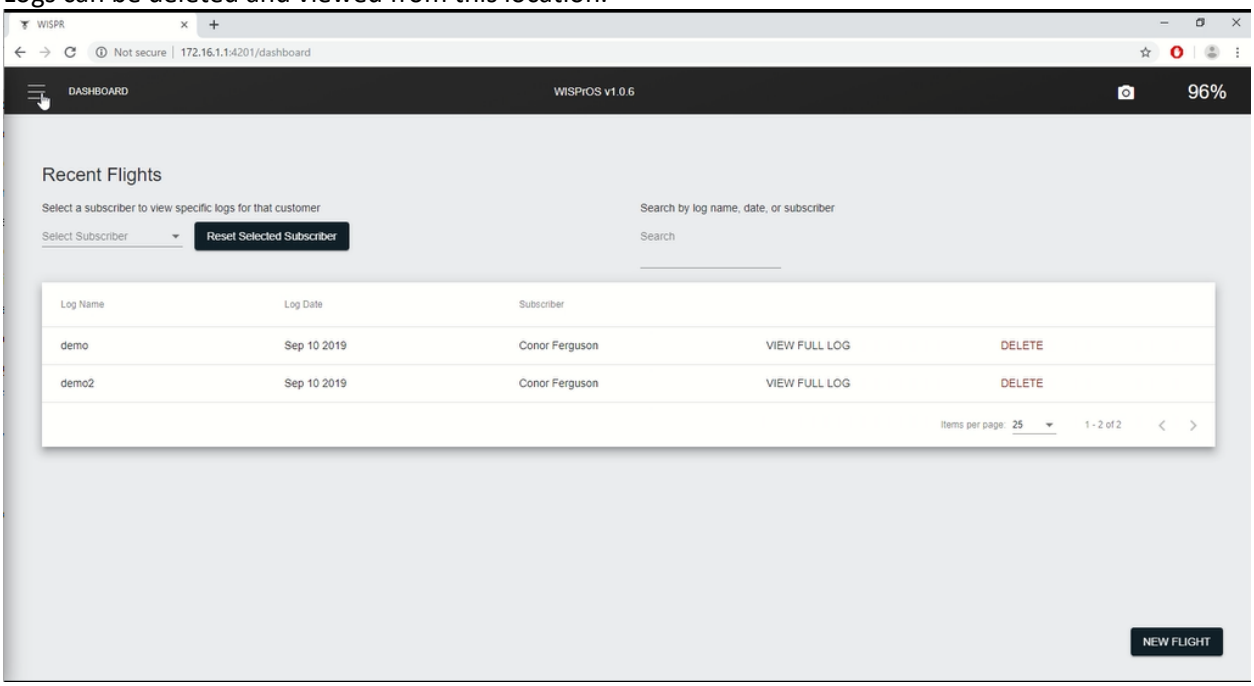
Flight Logs

To view flight logs on the WISPr OS, click ‘Flight Logs’ in the main menu.



Logs can be deleted and viewed from this location.



	Logs are used for survey reviews, for further analysis, in the field or at the office.
	Ensure there is adequate WISPr Cloud storage before running tests, or previous tests may be overwritten, or the test may not initiate if all memory space filled.

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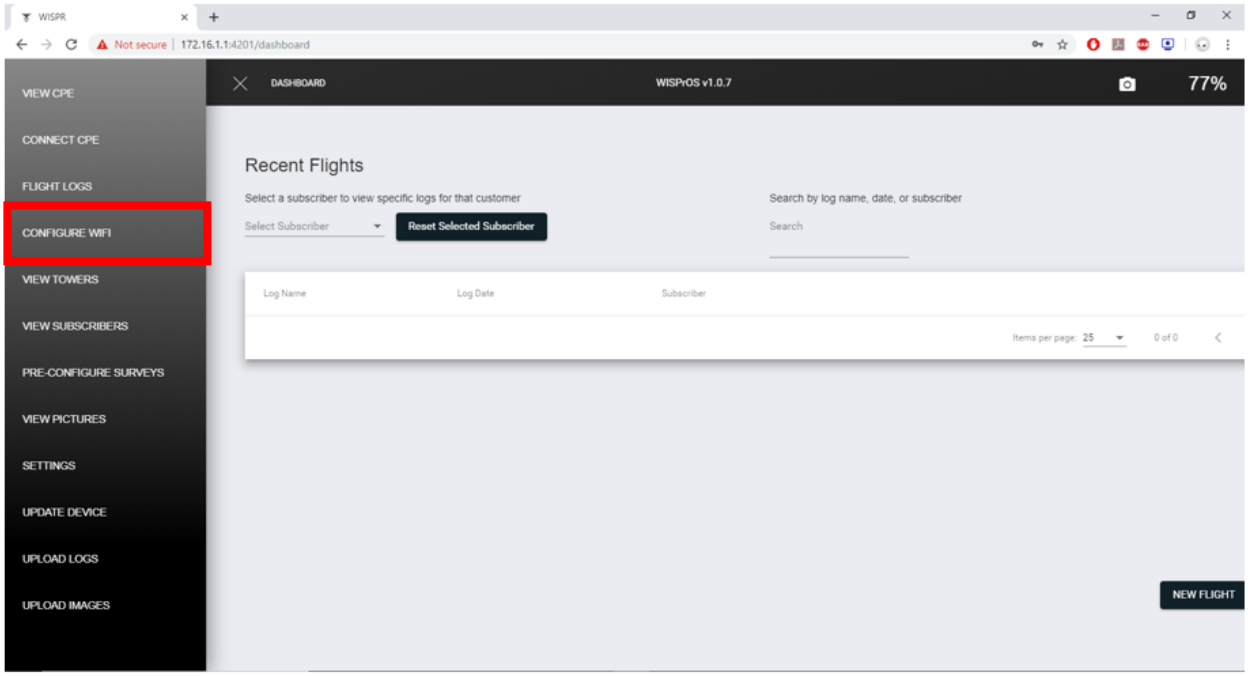
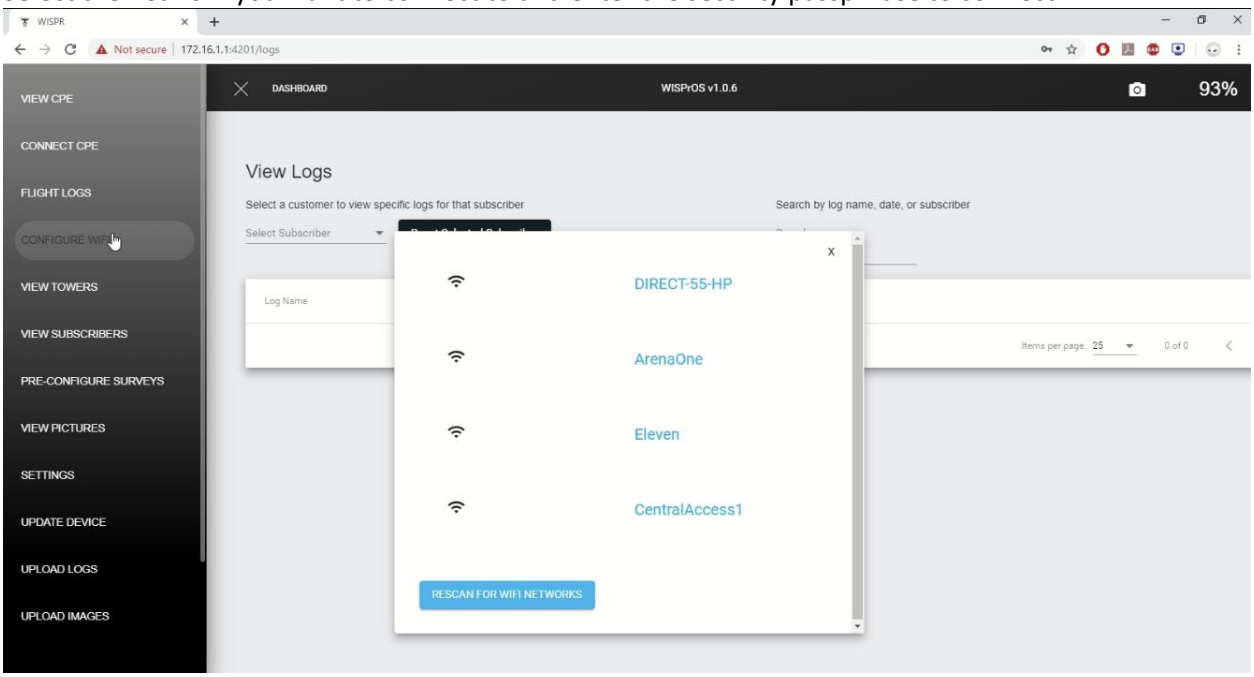
Configure Wi-Fi

To download pre-configured surveys, tower locations, subscribers and update the WISPr OS, simply connect your drones wi-fi to an internet source. To do so, in the main menu click Configure wi-fi and connect.



Select the network you want to connect to and enter the security passphrase to connect.



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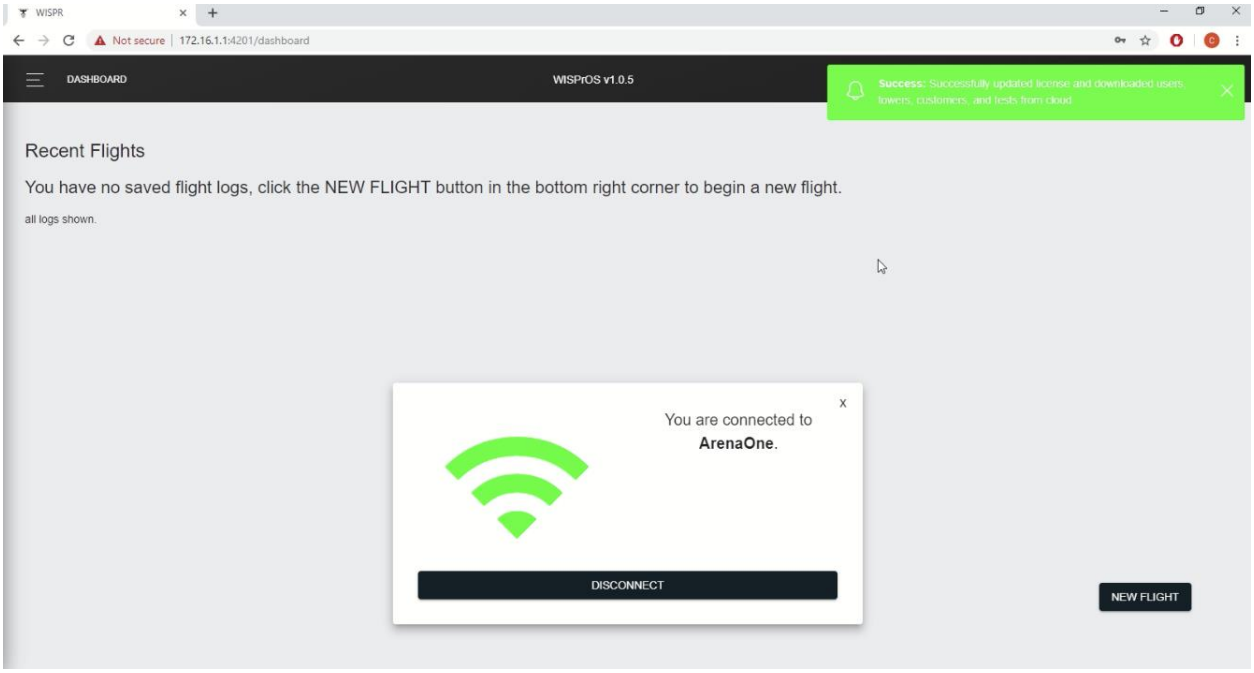
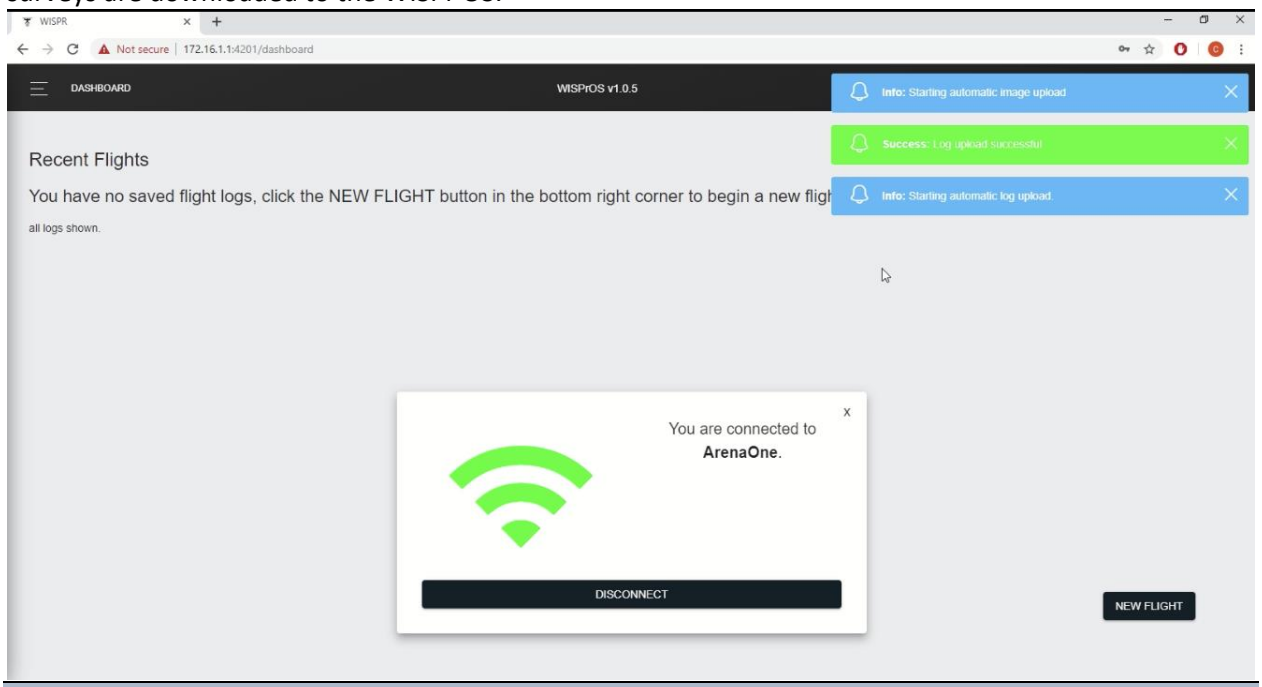
Once you are connected to the wi-fi source a success symbol will appear informing the user that the WISPr OS is connected to the wi-fi.



Toast messages will appear informing the user the tower locations, subscribers and pre-configured surveys are downloaded to the WISPr OS.



	Logs are used for survey reviews, for further analysis, in the field or at the office.
	Ensure there is adequate WISPr Cloud storage before running tests, or previous tests may be overwritten, or the test may not initiate if all memory space filled.
	NOTE: Do not connect to the Drone as the Wi-Fi, rather connect to a Wi-Fi SSID that has internet access. If the Drone will not connect to the Wi-Fi, ensure the password is correct

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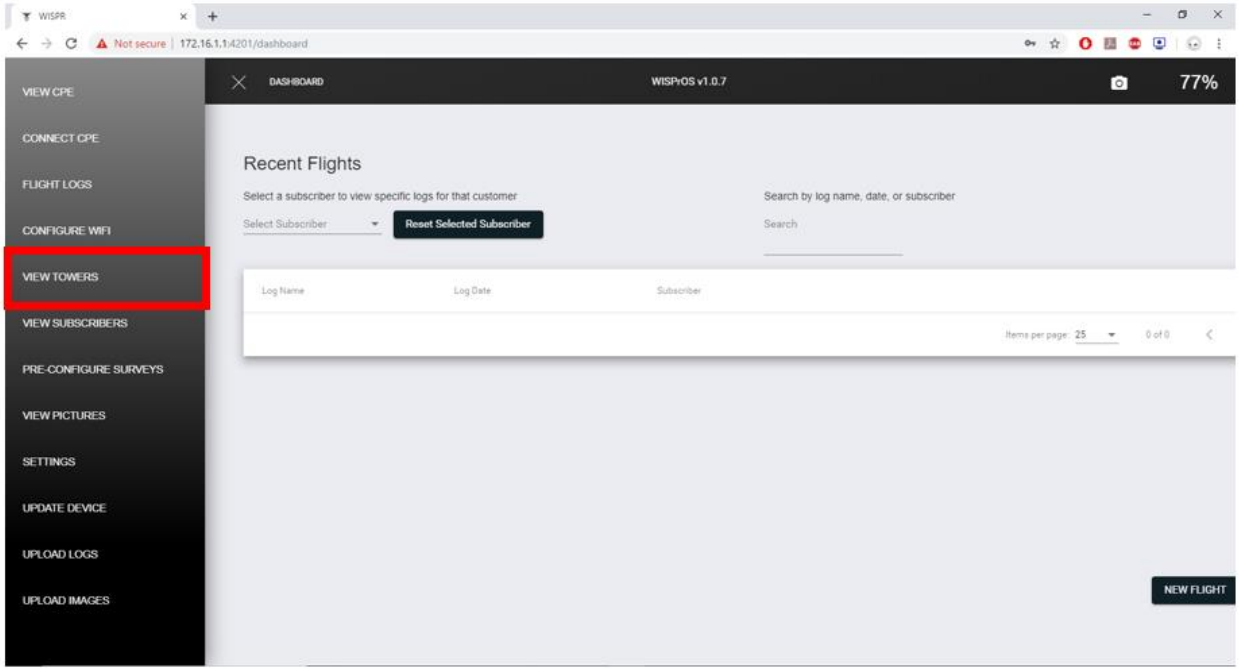
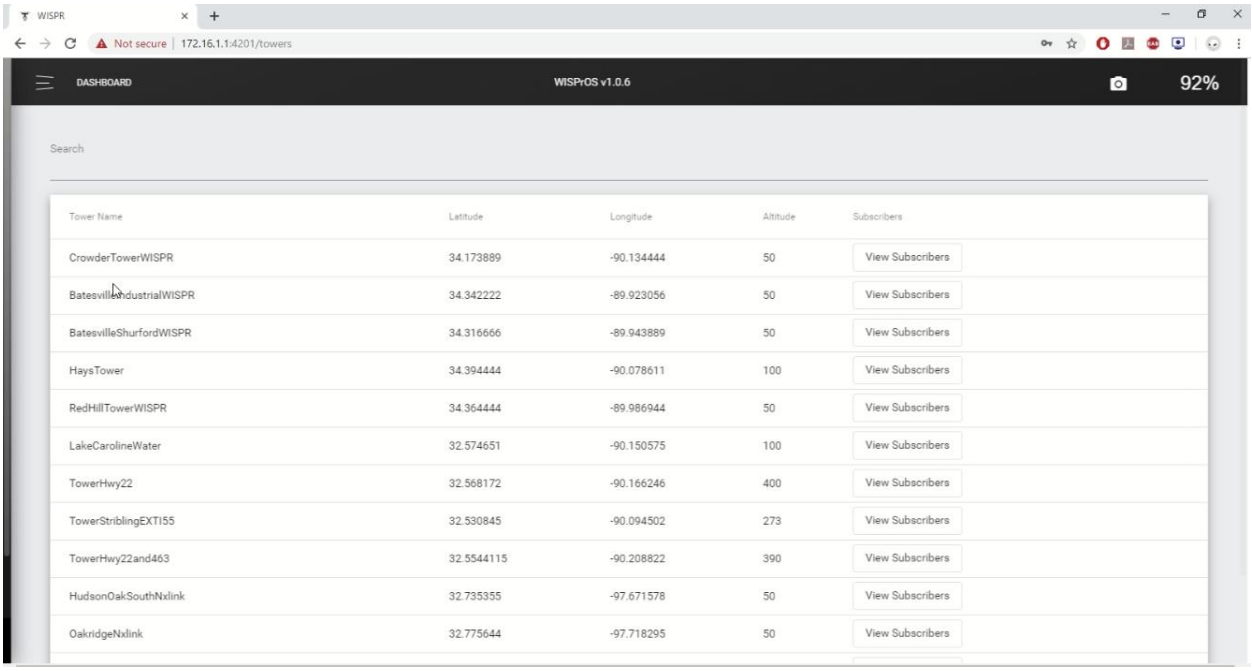
View Towers

To view what towers are downloaded to the WISPr OS, click ‘View Towers’ button on the main menu and a list of the towers will appear.



If any towers are not in the list that are needed for flight, connect the WISPr OS to a Wi-Fi source and the towers will be downloaded from the WISPr CLOUD.



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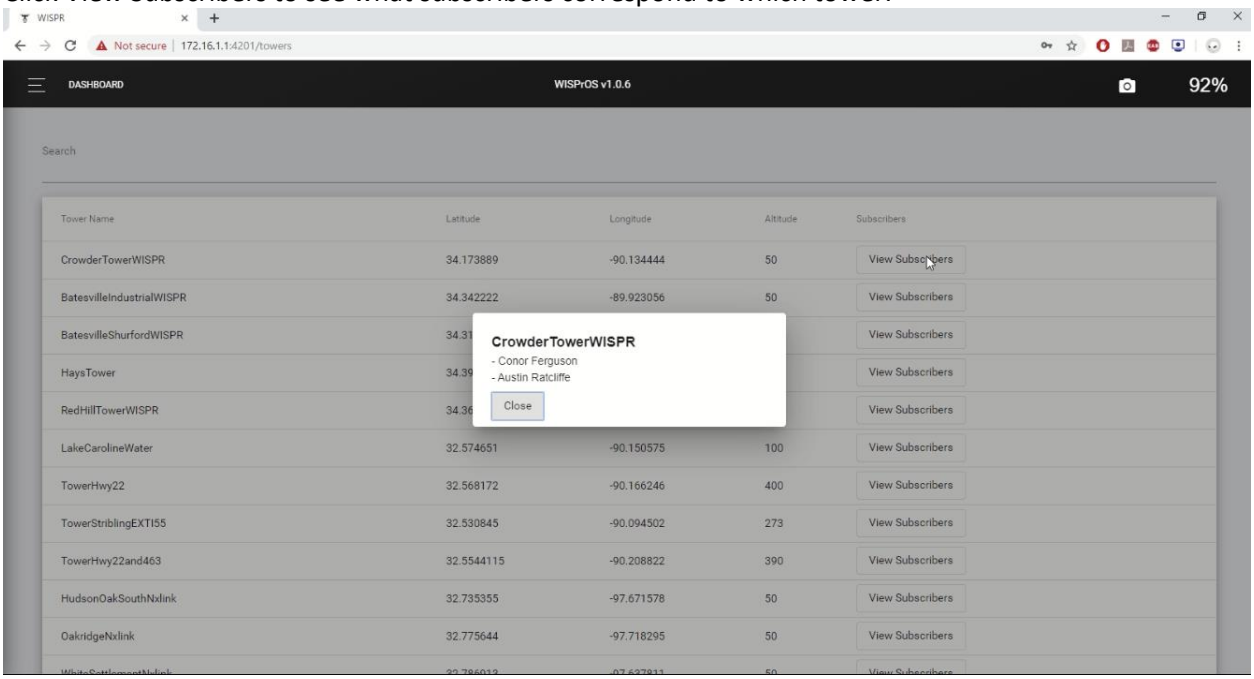
Click View Subscribers to see what subscribers correspond to which tower.



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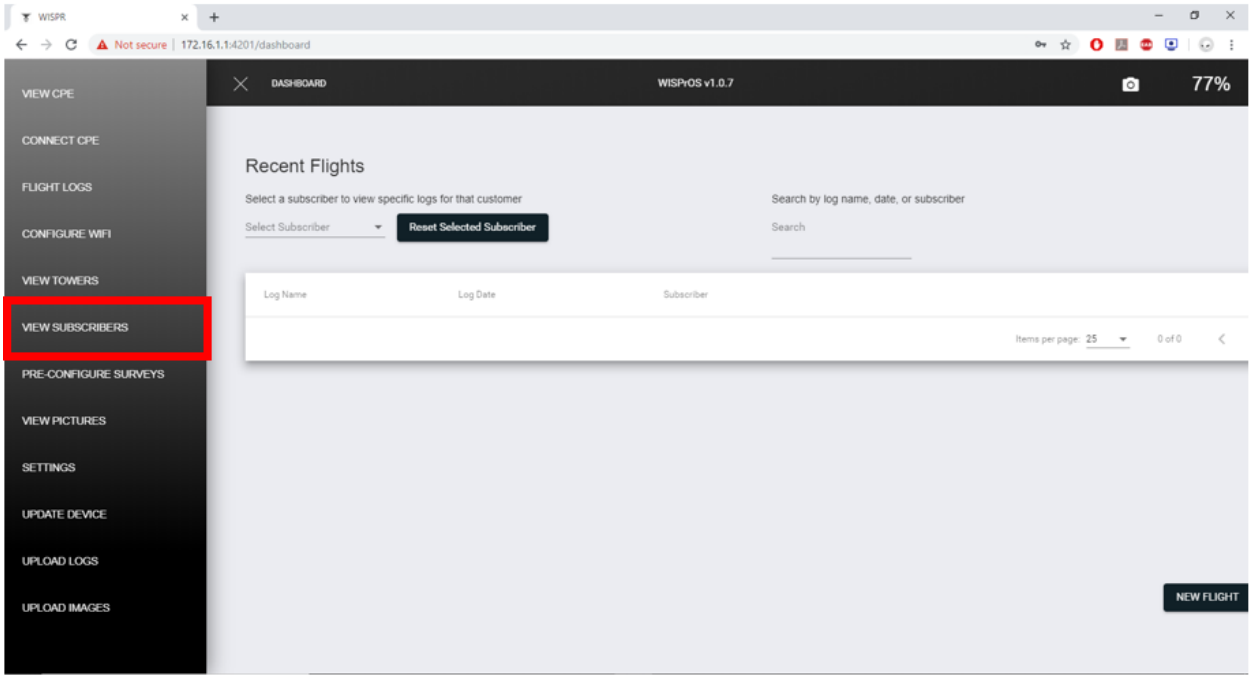
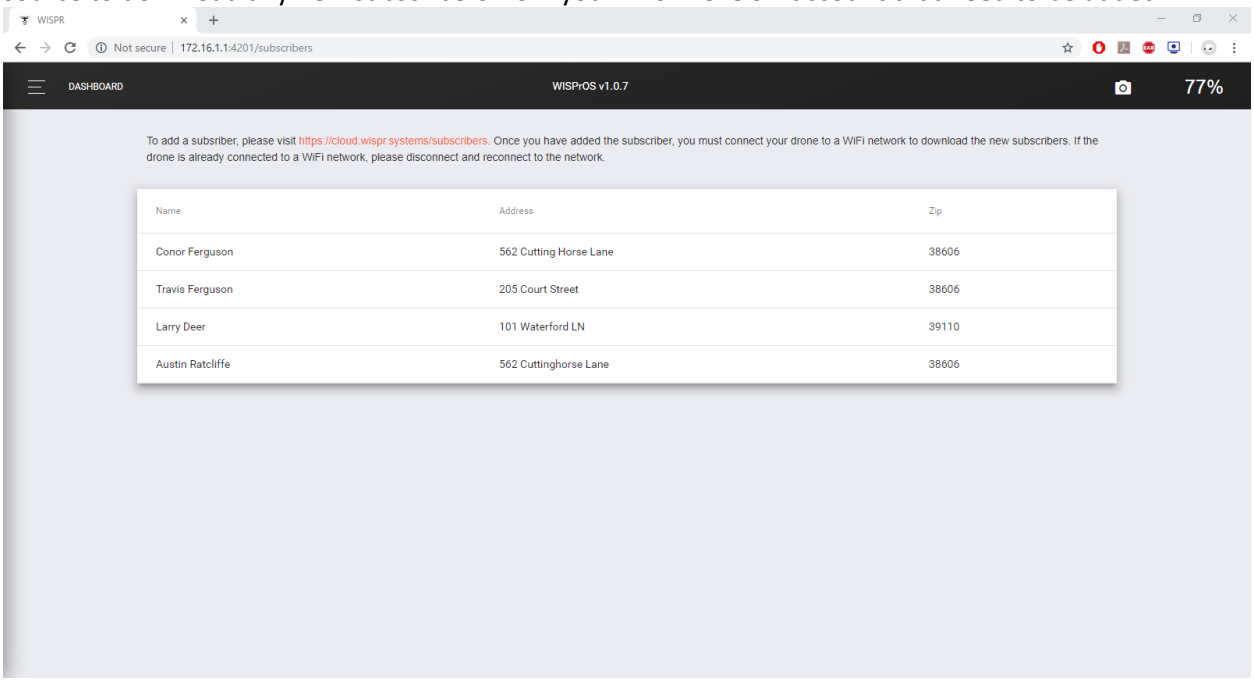
View Subscribers

To view all the subscribers, you have downloaded to the WISPr OS, click ‘View Subscribers’ in the main menu.



Once you have opened the Subscribers list you can either begin flight or connect the WISPr OS to a wi-fi source to download any new subscribers from your WISPr CLOUD account that need to be added.



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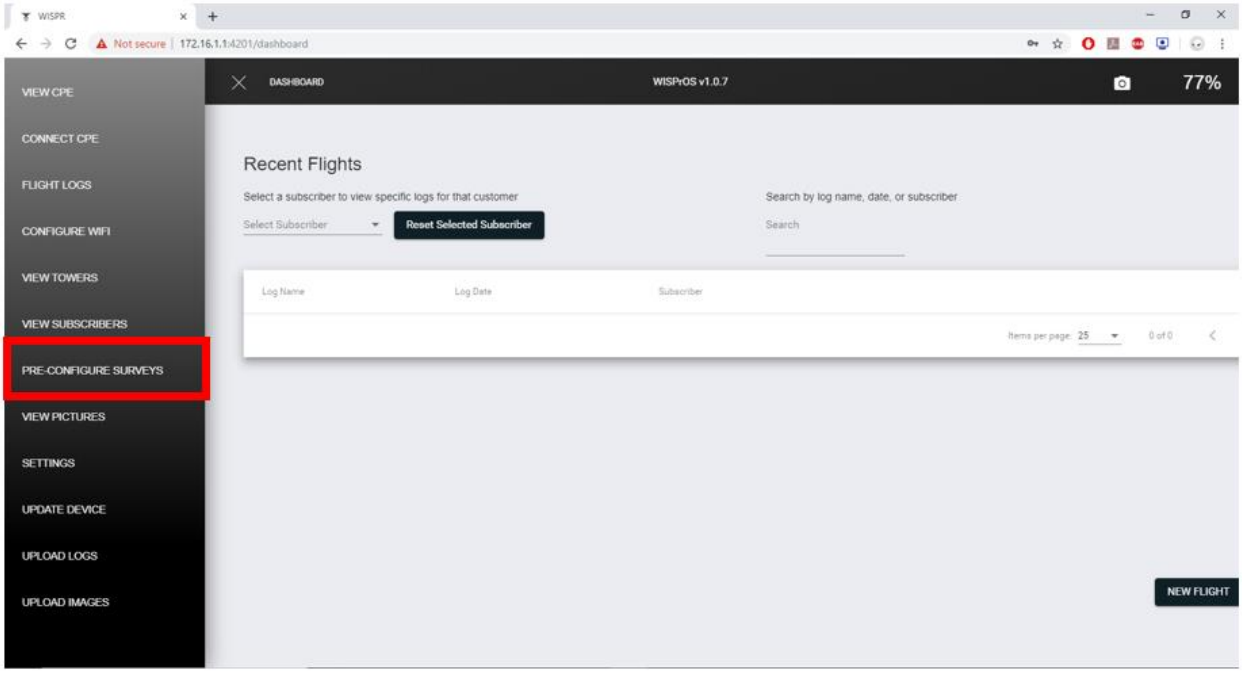
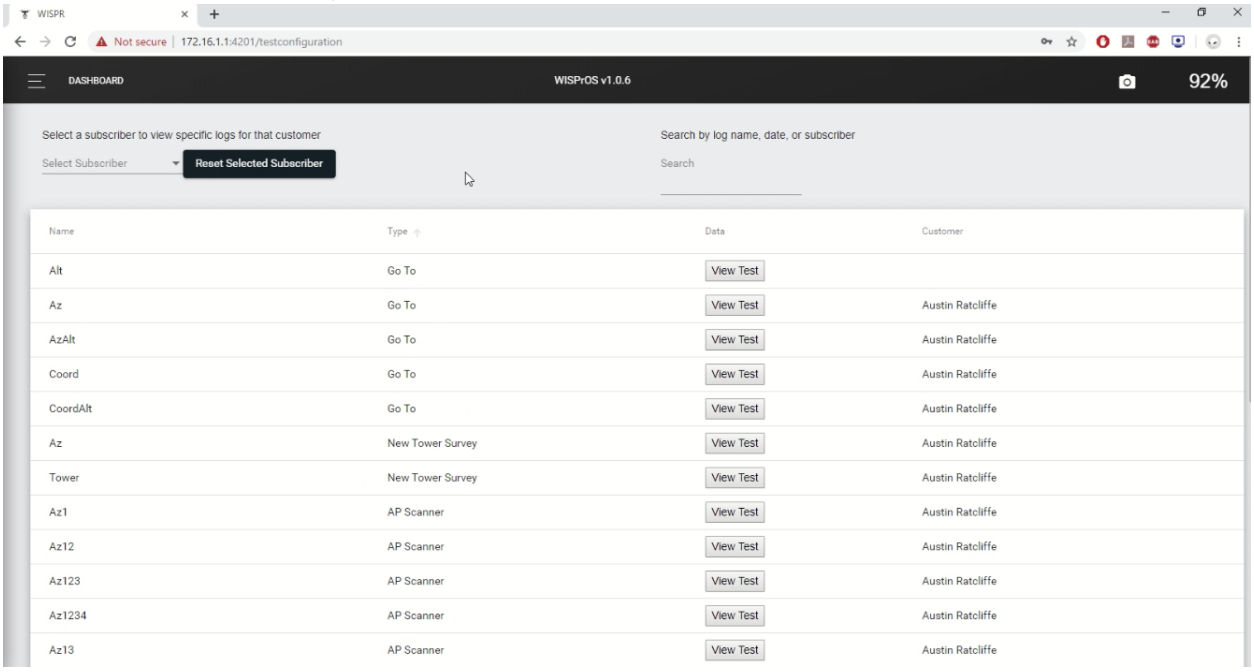
Pre-configured Surveys

To see what pre-configured surveys are downloaded onto the WISPr OS, click pre-configured surveys in the main menu.



To view the test credentials, select View Test.



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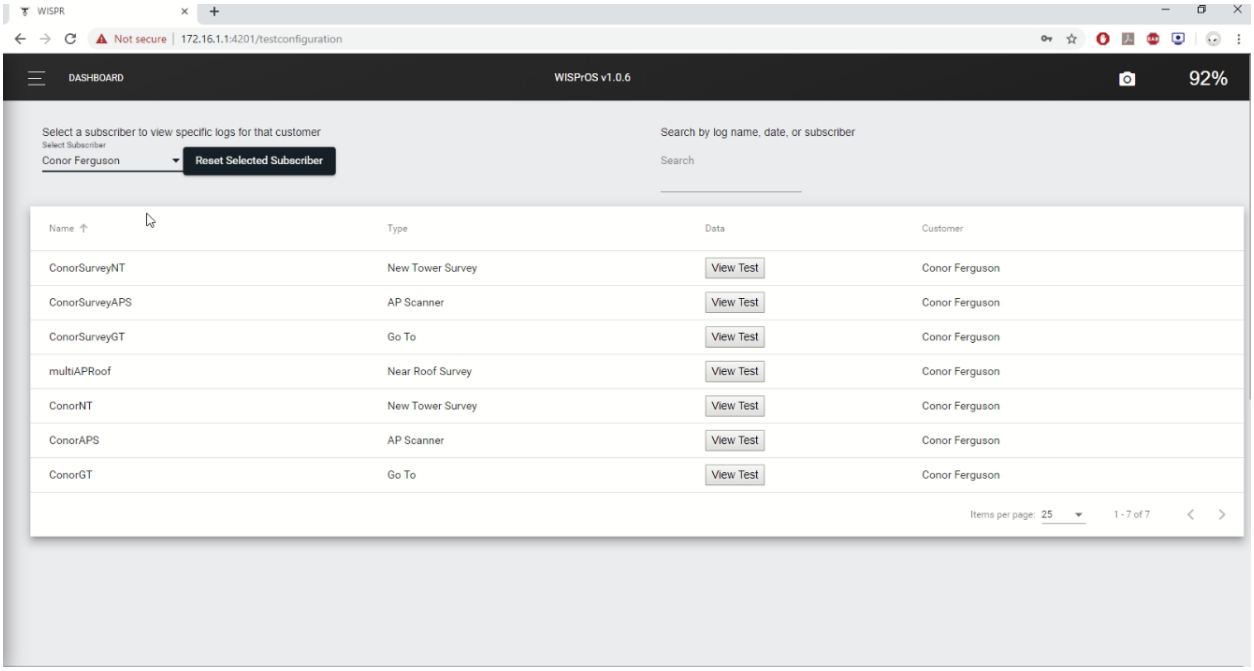
Search for pre-configured surveys corresponding to a new or old subscriber by selecting that customers name.



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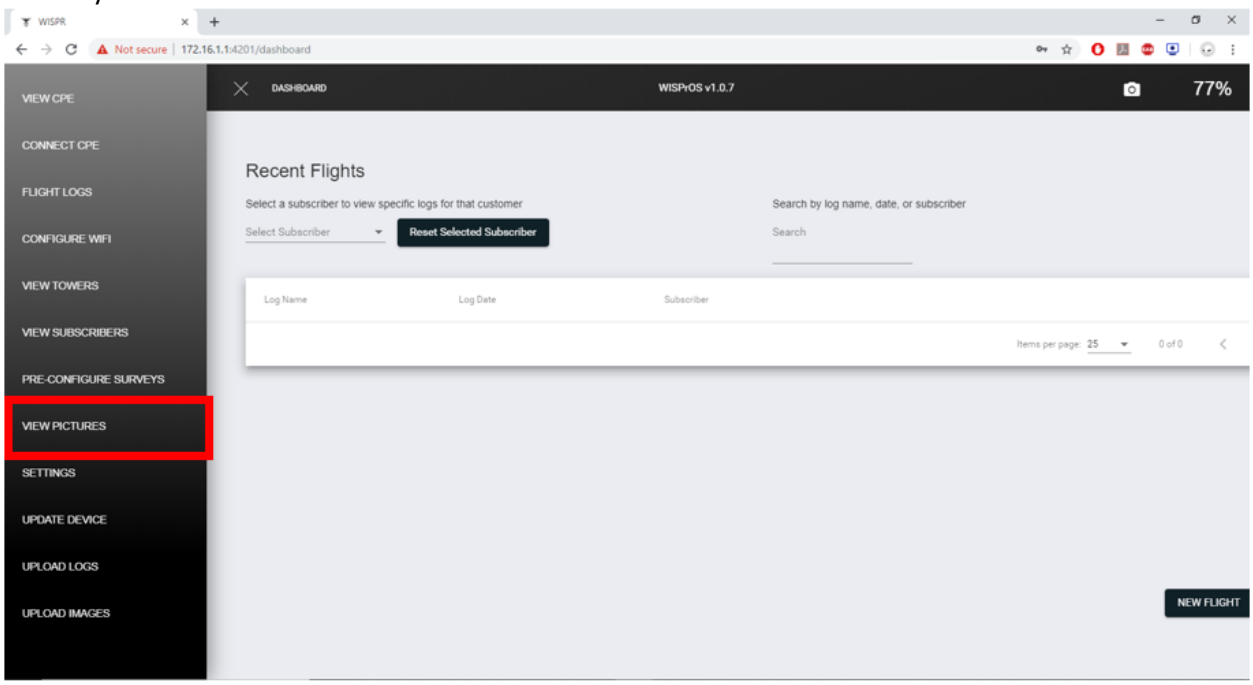
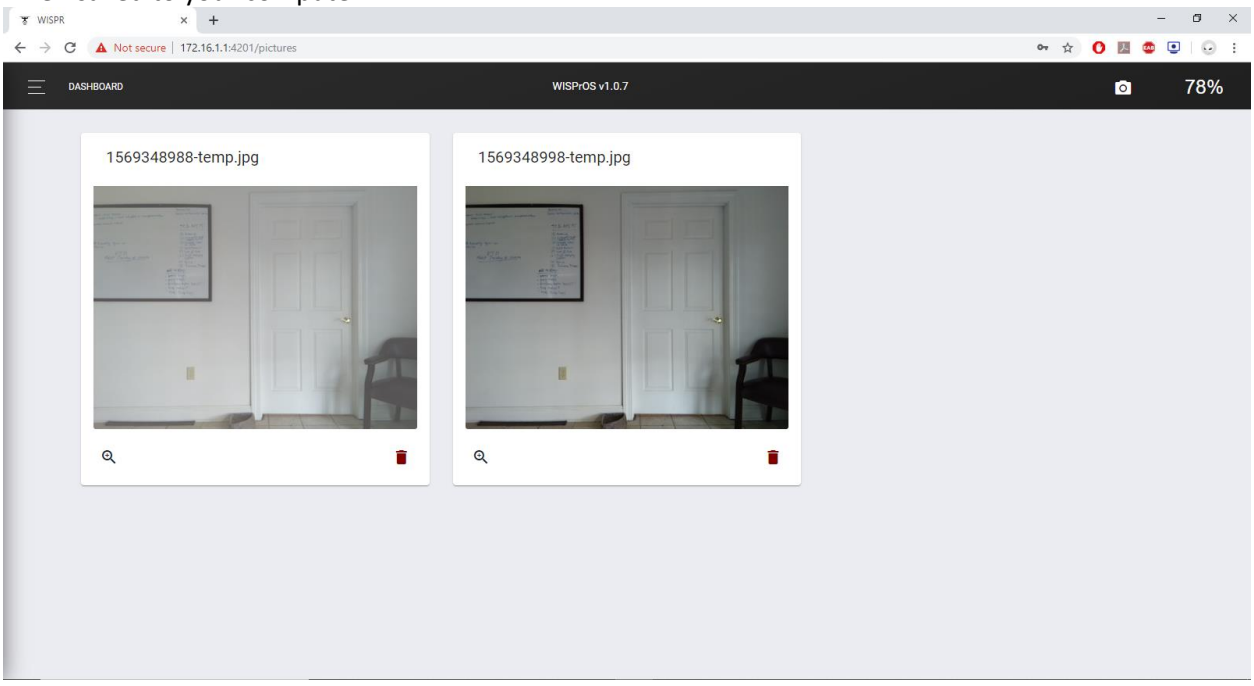
View Pictures

To view pictures taken during flight, click the 'View Pictures' button on the main menu to view pictures taken by the WISPr OS.



Metadata is stored with each picture taken. When uploaded to the WISPr CLOUD the data is visible and when saved to your computer.



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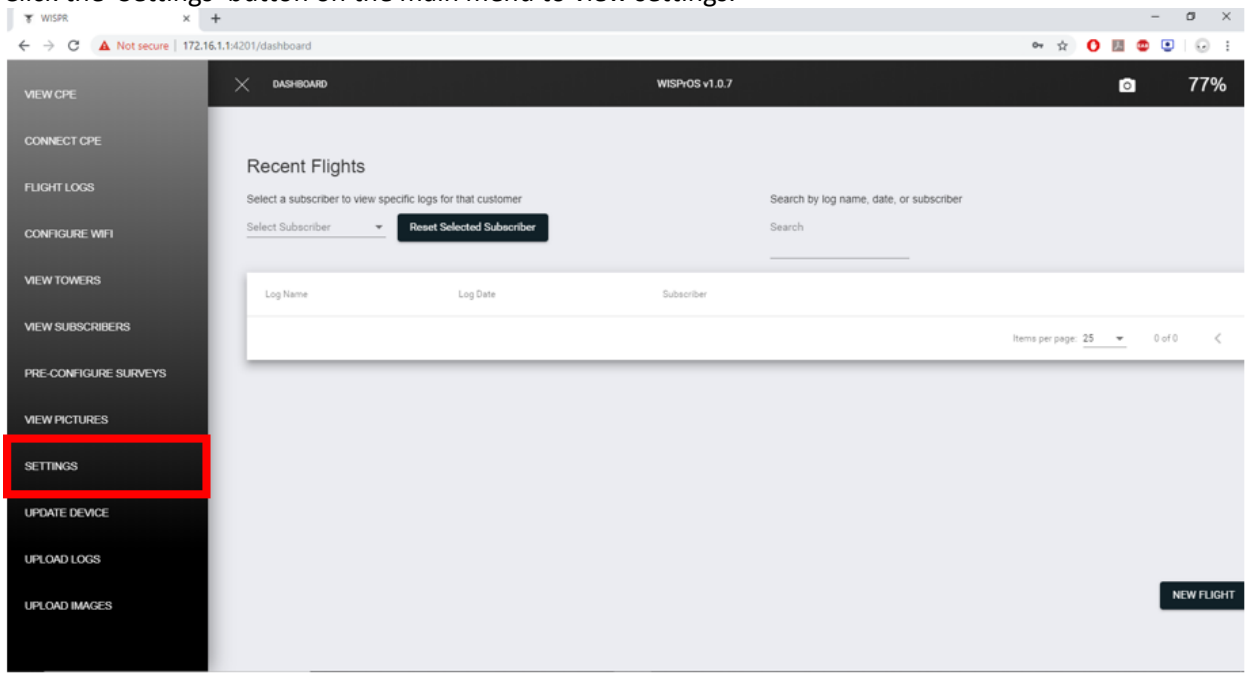
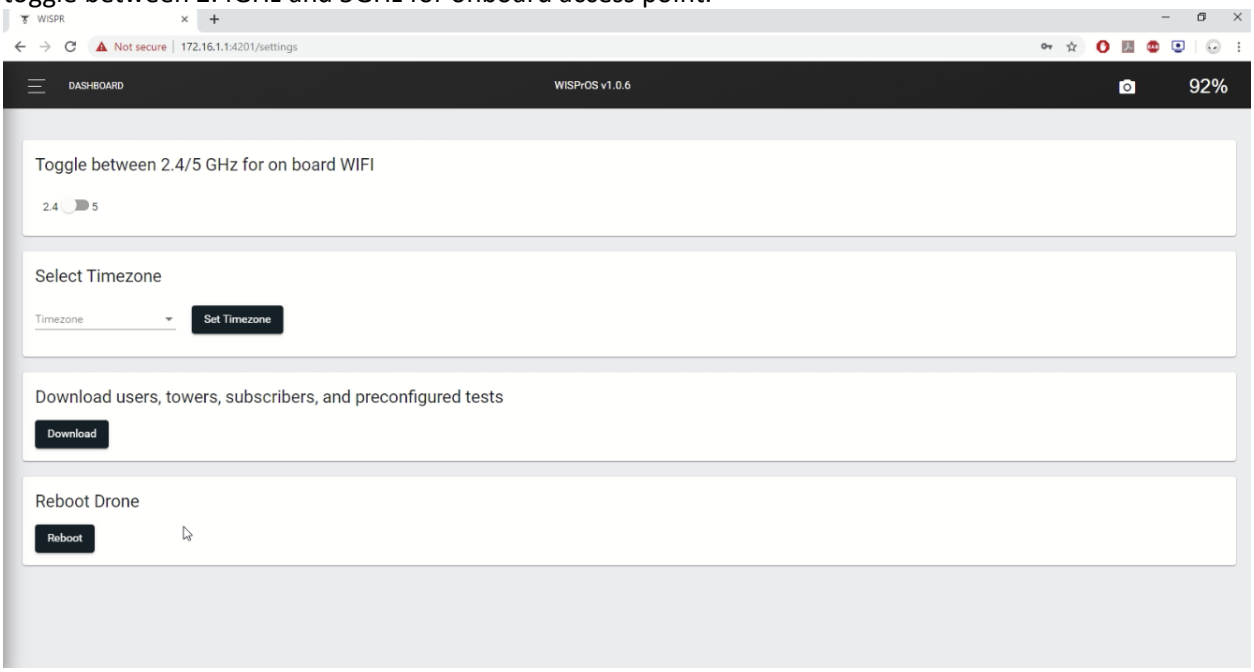
Settings

Click the 'Settings' button on the main menu to view settings.



Settings is available to manually download drone users, towers, subscribers, pre-configured survey, toggle between 2.4GHz and 5GHz for onboard access point.



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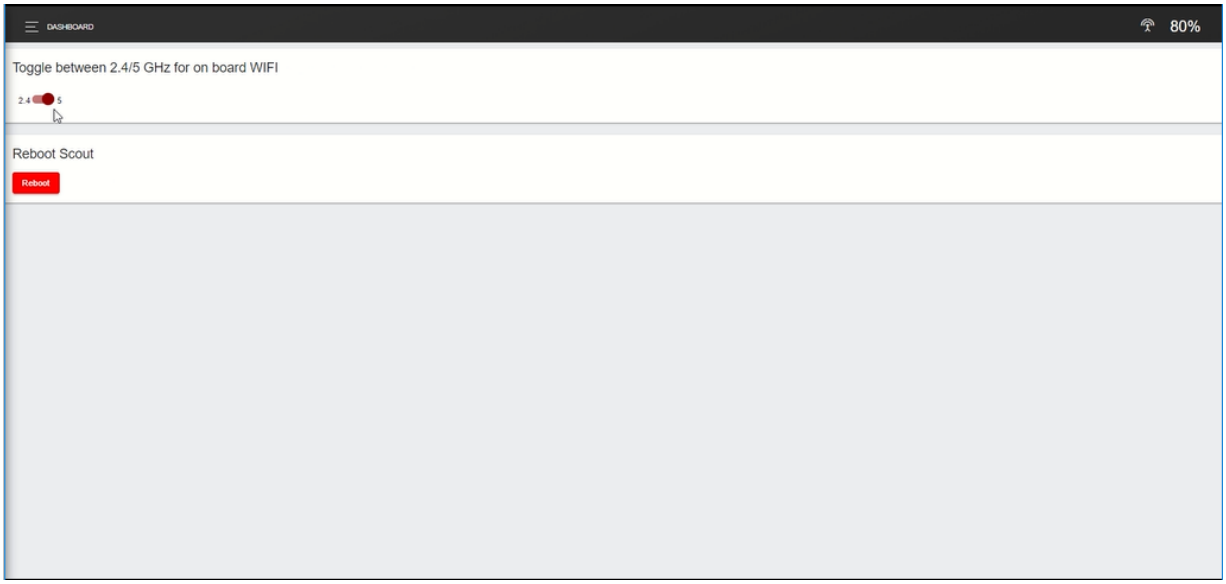
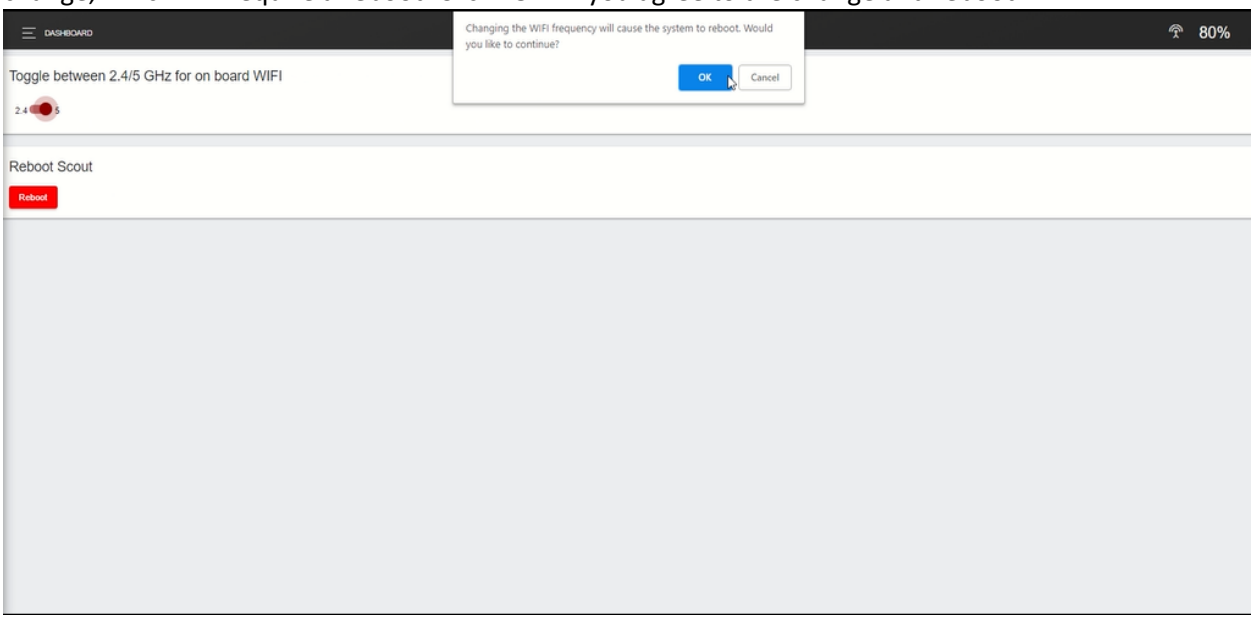
Change access point frequency

To avoid overlapping frequencies while surveying the WISPr Drone access point can be changed from 2.4GHz to 5GHz and vice versa. After the user has selected to change the access point frequency, the Drone will need to reboot to make the change.
First open the main menu and click “SETTINGS” to navigate to change the access point frequency button.

Slide the button to the left for 2.4GHz or slide the button to the right for 5GHz access point frequency. Default frequency will be 2.4GHz.



Shortly after the button is moved a message will appear asking for confirmation of the frequency change, which will require a reboot. Click “OK” if you agree to the change and reboot.



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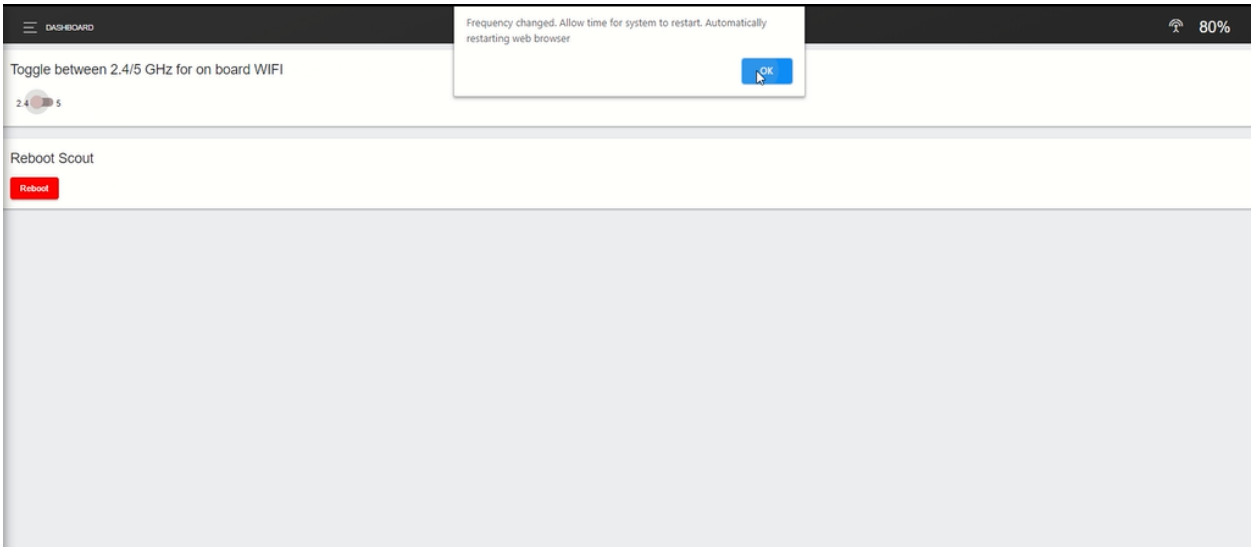
A second message will appear, informing the user the frequency has been changed. Allow time for the



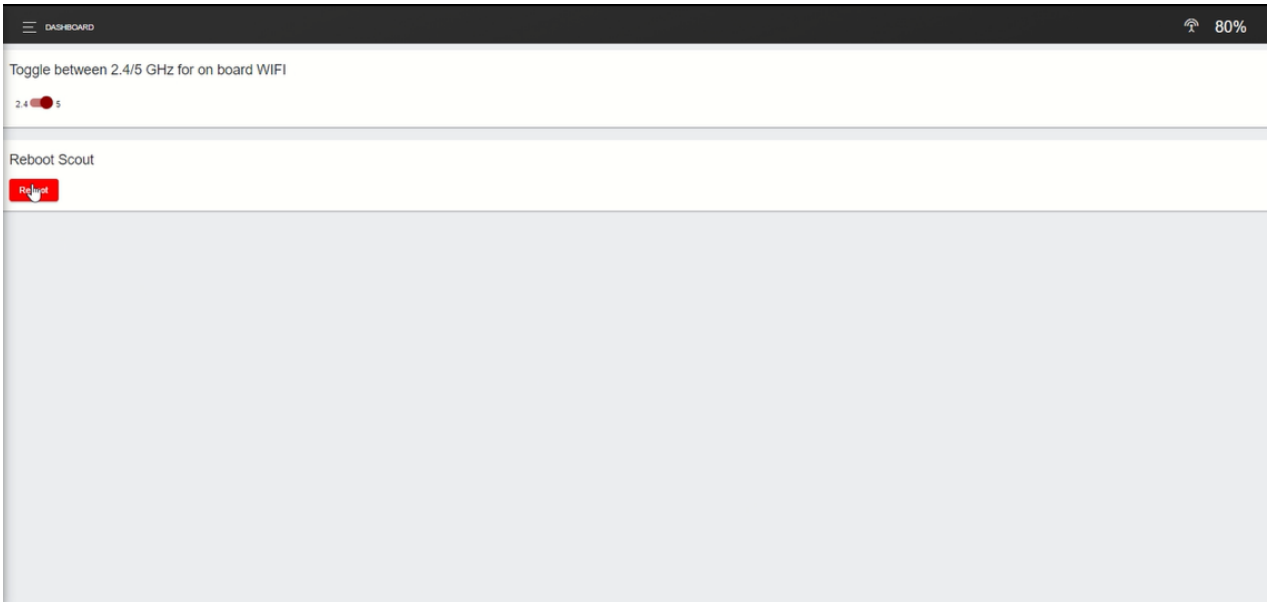
system to restart and reconnect to the access point.

	Frequency broadcast switching is not an automatic function. It must be set manually.
	Some computers have a dual band Wi-Fi IC installed, but in most cases a dual band Wi-Fi dongle is needed to swap between broadcast frequencies.
	If the Wi-Fi network becomes invisible at any time, the computer's Wi-Fi IC in use may not operate on the same frequency, therefore a Dual Band Wi-Fi Dongle may need to be used to swap back to 2.4GHz

Reboot Device

Reboot is available to quickly reboot the Drone after updating and when changing configuration of the CPE antenna on the Drone it be preferred to reboot the Drone when the antenna reboots after configuration.

To reboot click "REBOOT"



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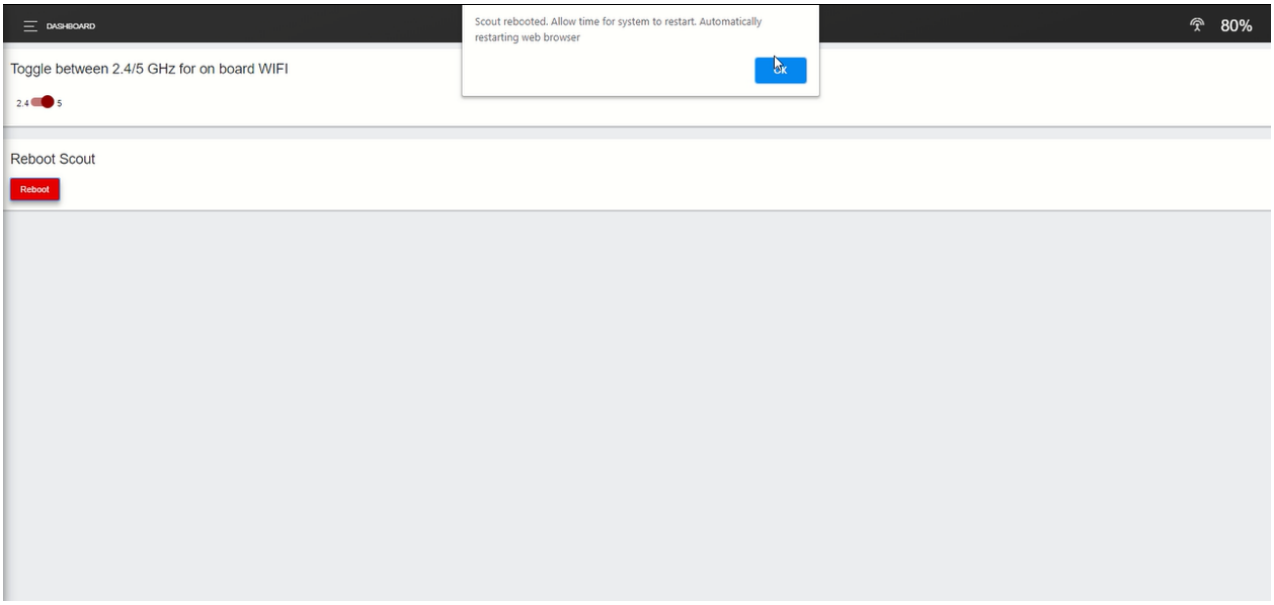
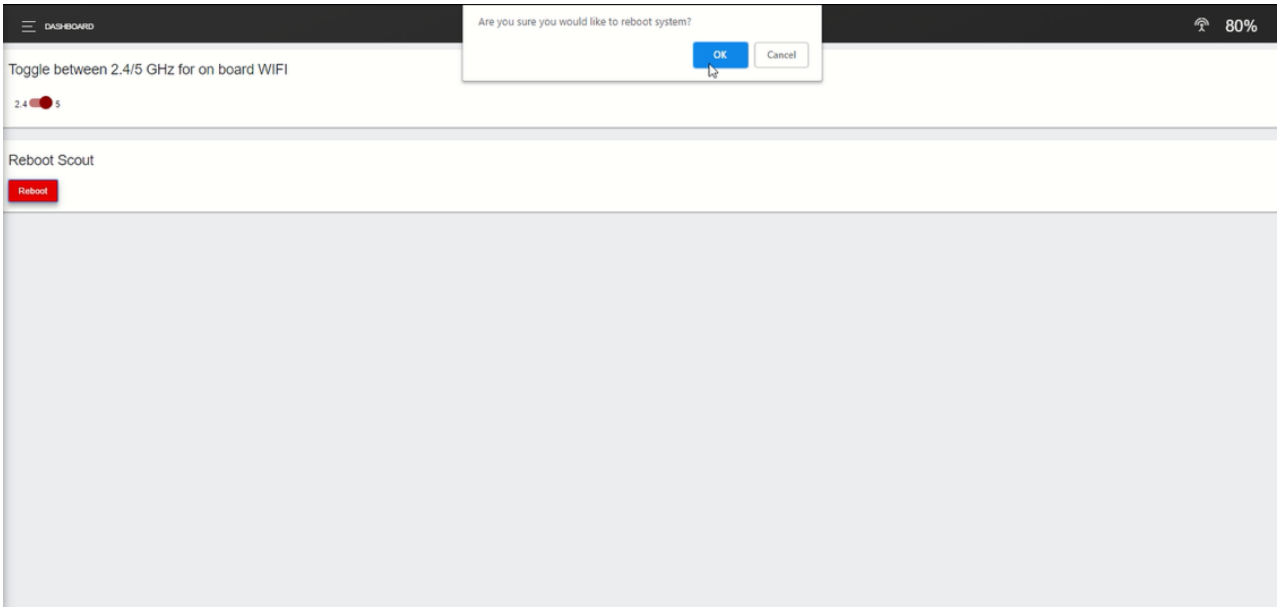
You will be asked to confirm you want to reboot, click “OK” to agree.



A success message will appear informing the user that the Drone has rebooted, click “OK” to exit the



message.

After a reboot has taken place, the user has the option to reconnect to the Drone’s access point and fly again or after Drone’s access point network has reappeared the user can unplug the battery XT90 connectors and prepare the Drone for Storage.

⚠ Reboots are MANDITORY after update. The Drone will not apply update settings until the next bootup sequence.

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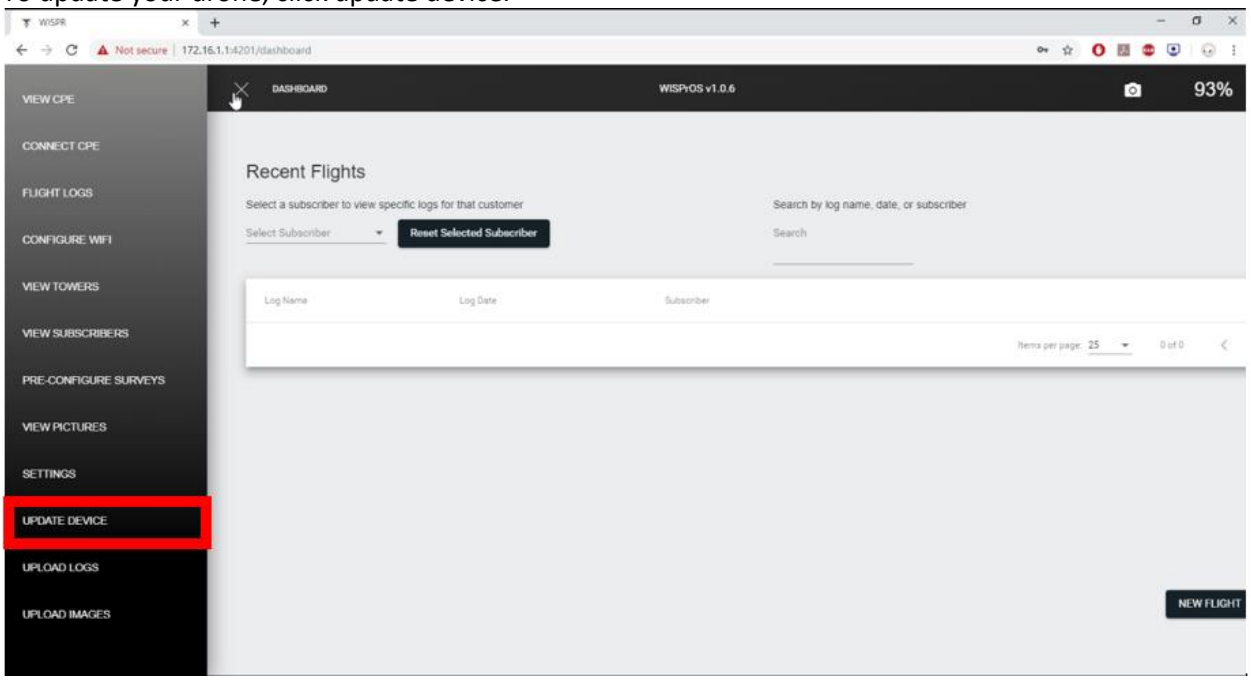
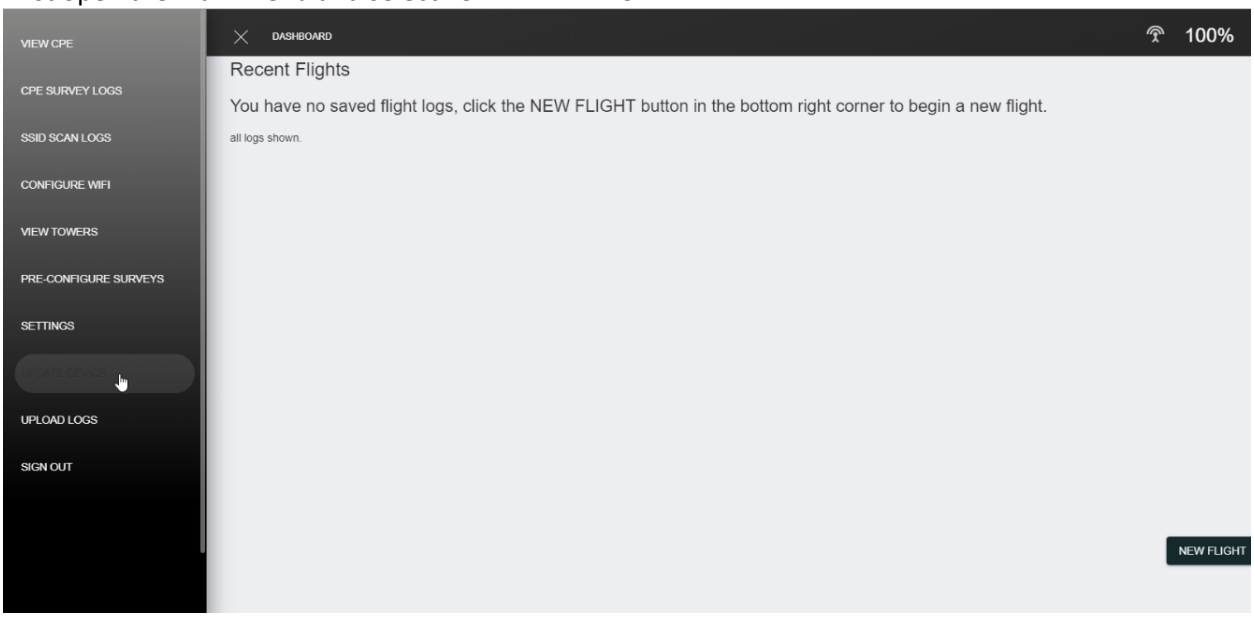
Update Device

To update your drone, click update device.



The WISPr OS software is constantly updated and needs to be up to date on the WISPr Drone to confirm the software unit is stable. When purchasing upgraded software packages, they will trigger an update through the WISPr Cloud account this can easily be added to the users update repository after purchasing. If the Drone is in-doors make sure the propellers are not on the Drone. Make sure battery female XT90 connector is plugged in the Drone male XT90 connector and the battery is fully charged before attempting to update.

First open the main menu and select “UPDATE DEVICE”



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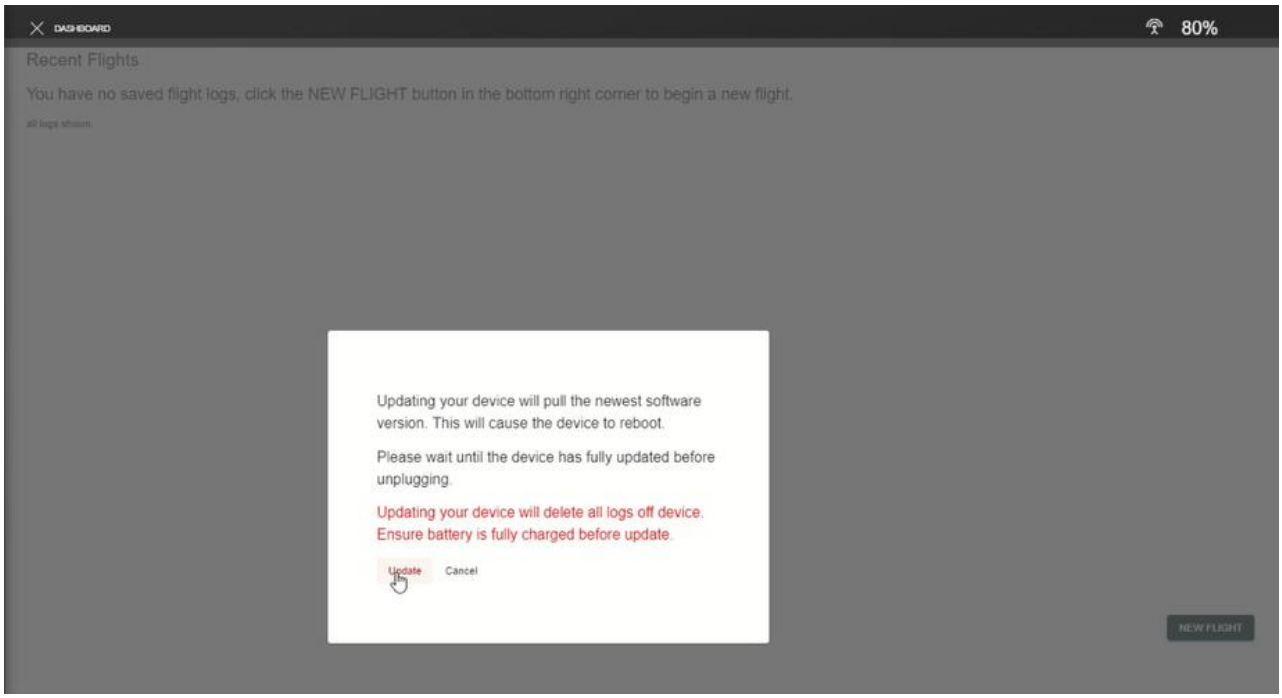
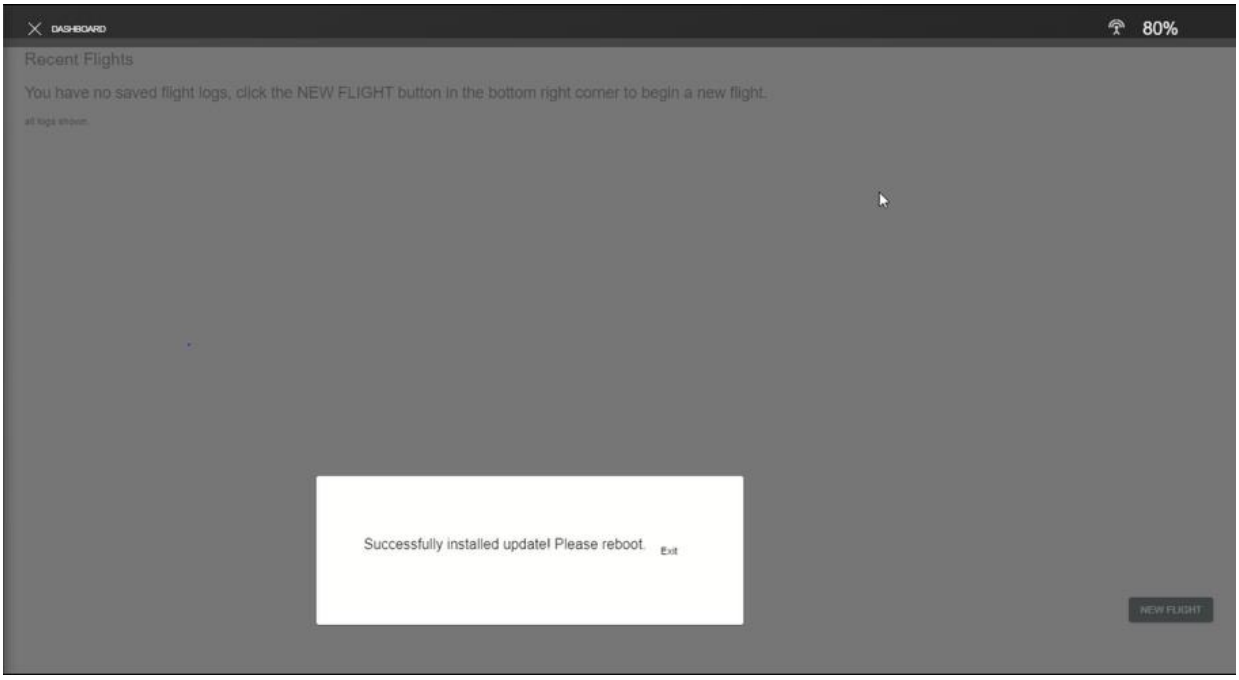
After navigated to the update device screen click the “UPDATE” button to begin update



After the update is complete a success message will inform the user the update was a success and the Drone will need to be rebooted for the update to finalize



	The Drone must be connected to a Wi-Fi network with internet access to update.
	DO NOT unplug the Drone during update, as this could corrupt the Drones software.

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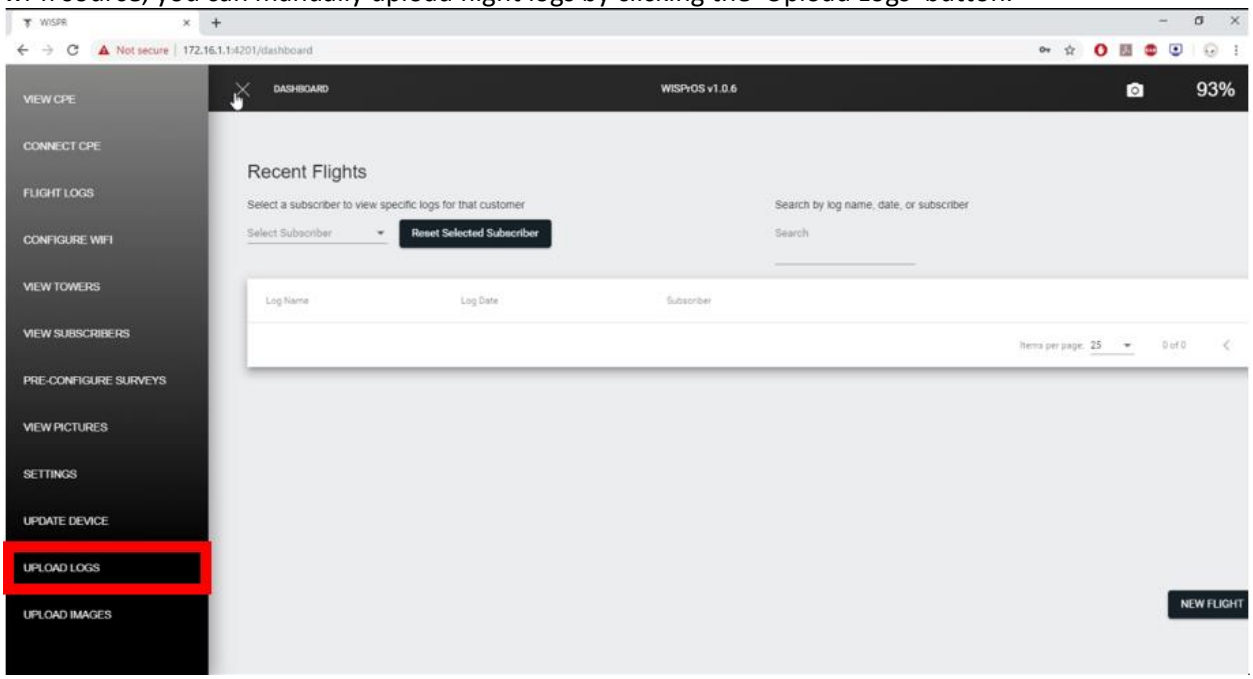
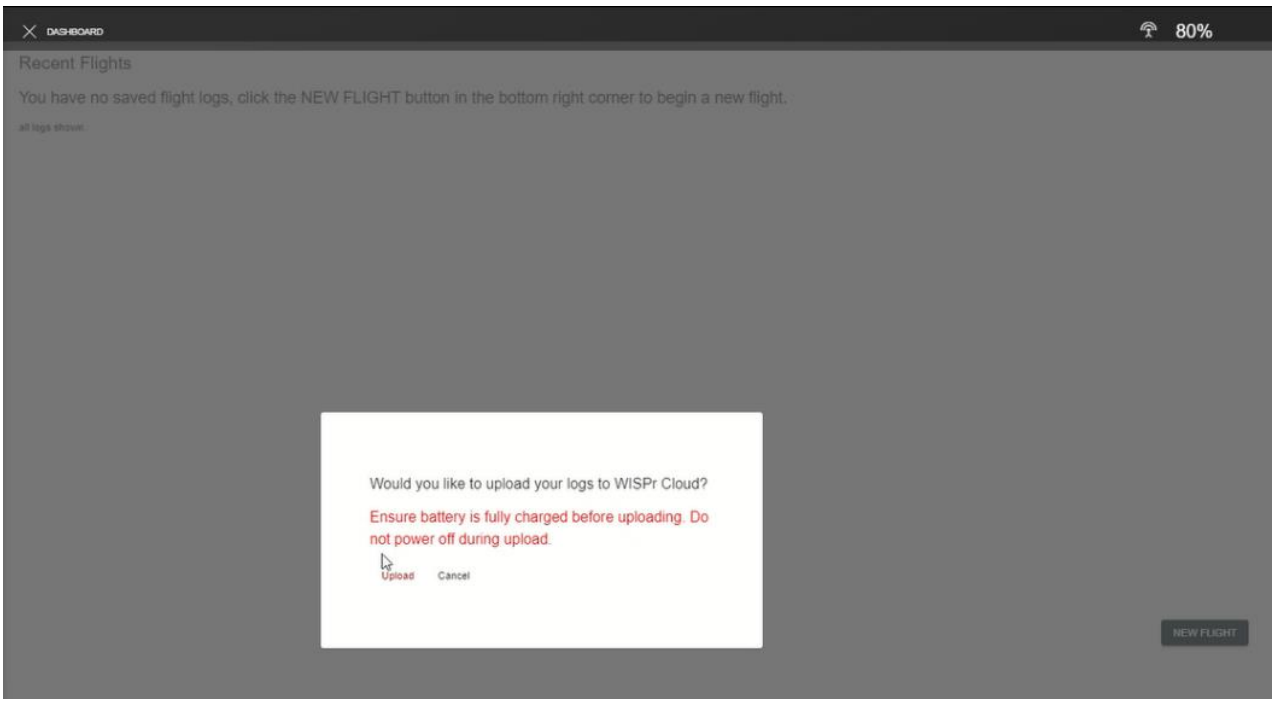
Upload Logs

If your flight logs do not automatically upload to the WISPr CLOUD after connecting the WISPr OS to a wi-fi source, you can manually upload flight logs by clicking the 'Upload Logs' button.



Next click "UPLOAD" to upload log



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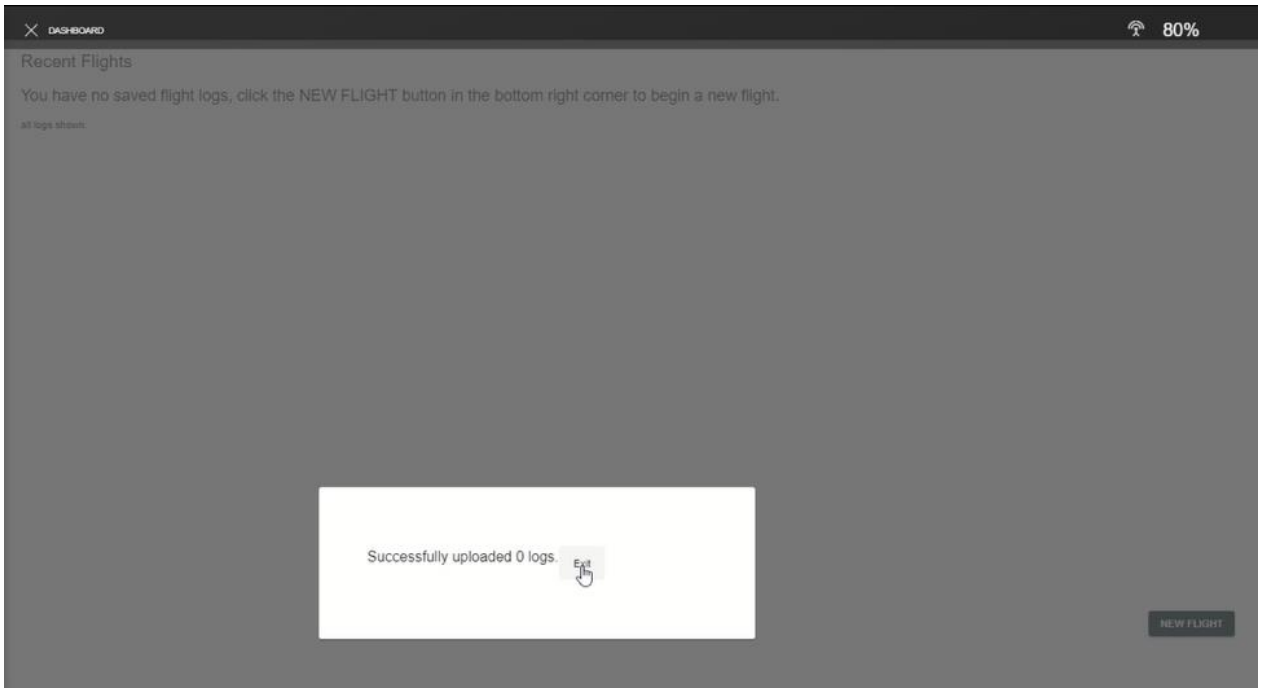
A success message will inform the user the logs have been uploaded to the WISPr Cloud.
After uploaded to the cloud they will be deleted from the Drones on-board memory. No logs were on the Drone when this example was made, which is why 0 logs is shown.



If the logs will not upload, check if you are connected to the Wi-Fi.
If the logs will not upload, ensure there is adequate space on the WISPr Cloud.

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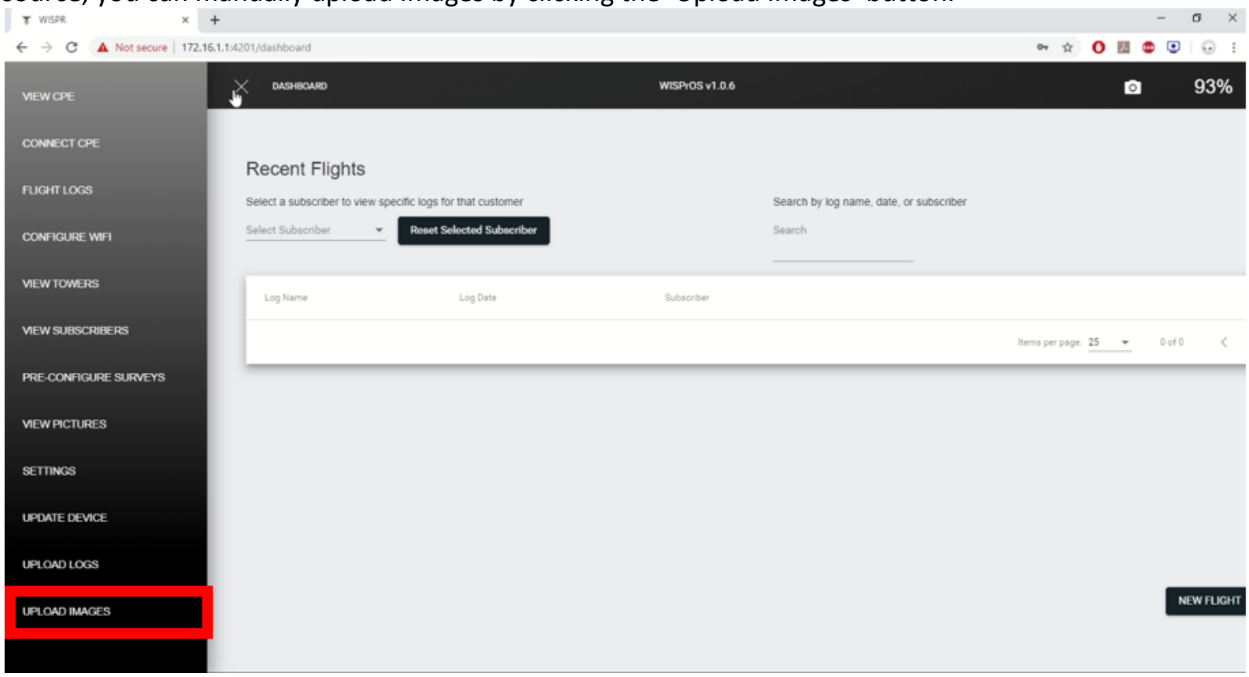
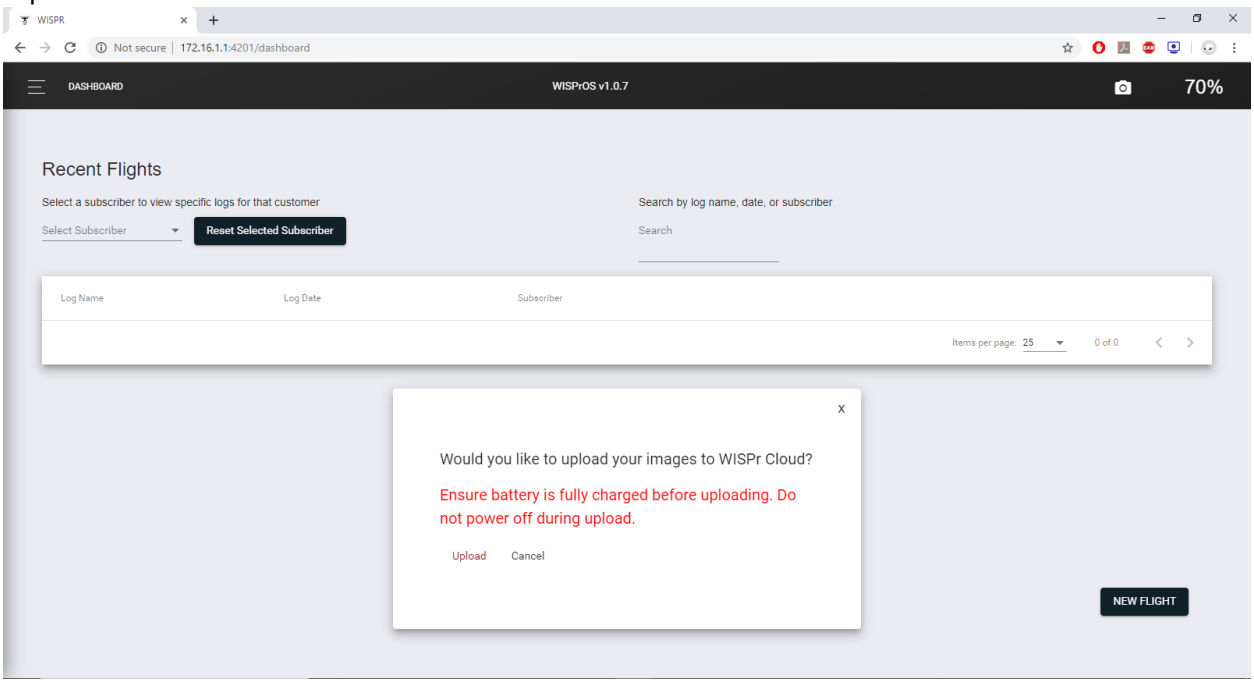
Upload Images

If your Images do not automatically upload to the WISPr CLOUD after connecting the WISPr OS to a wi-fi source, you can manually upload Images by clicking the ‘Upload Images’ button.



After selecting ‘Upload Images’ a pop-up will ask would you like to upload your images, simply click ‘Upload’



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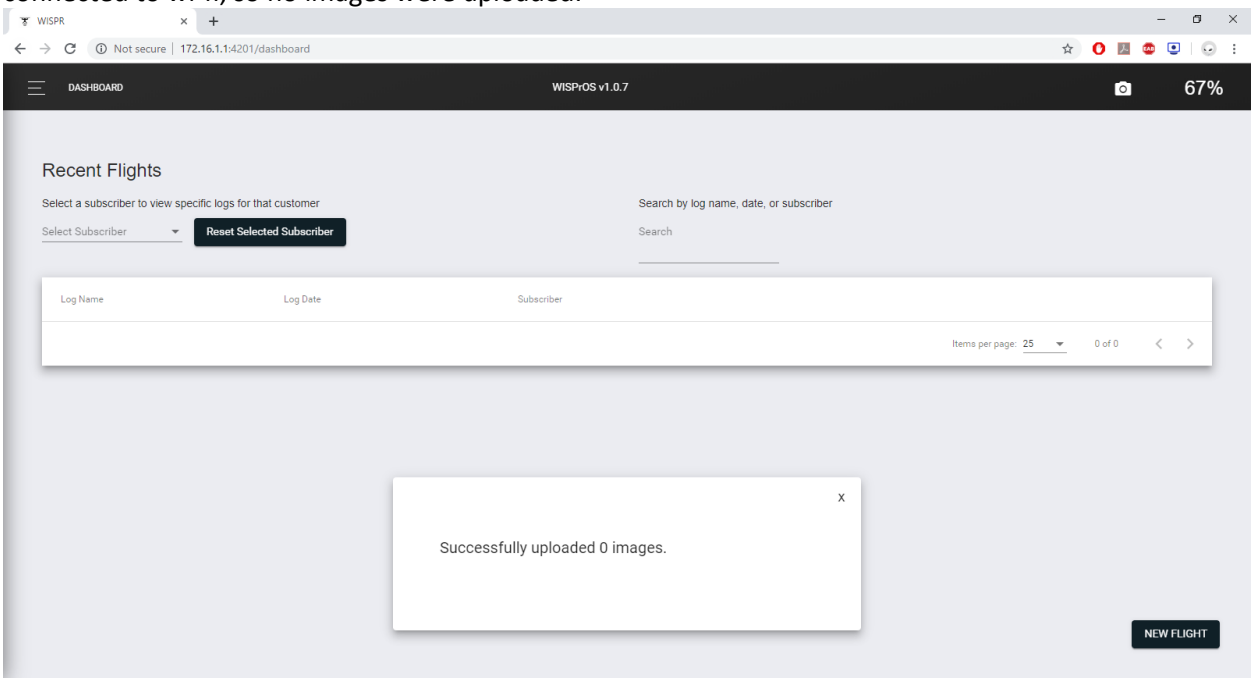
After images upload to the WISPr CLOUD a success message will appear informing the user the images have been uploaded to the WISPr CLOUD. In this examples the images were uploaded when the drone connected to wi-fi, so no images were uploaded.



If the images will not upload, check if you are connected to the Wi-Fi.
If the images will not upload, restart the upload or reboot and try again.

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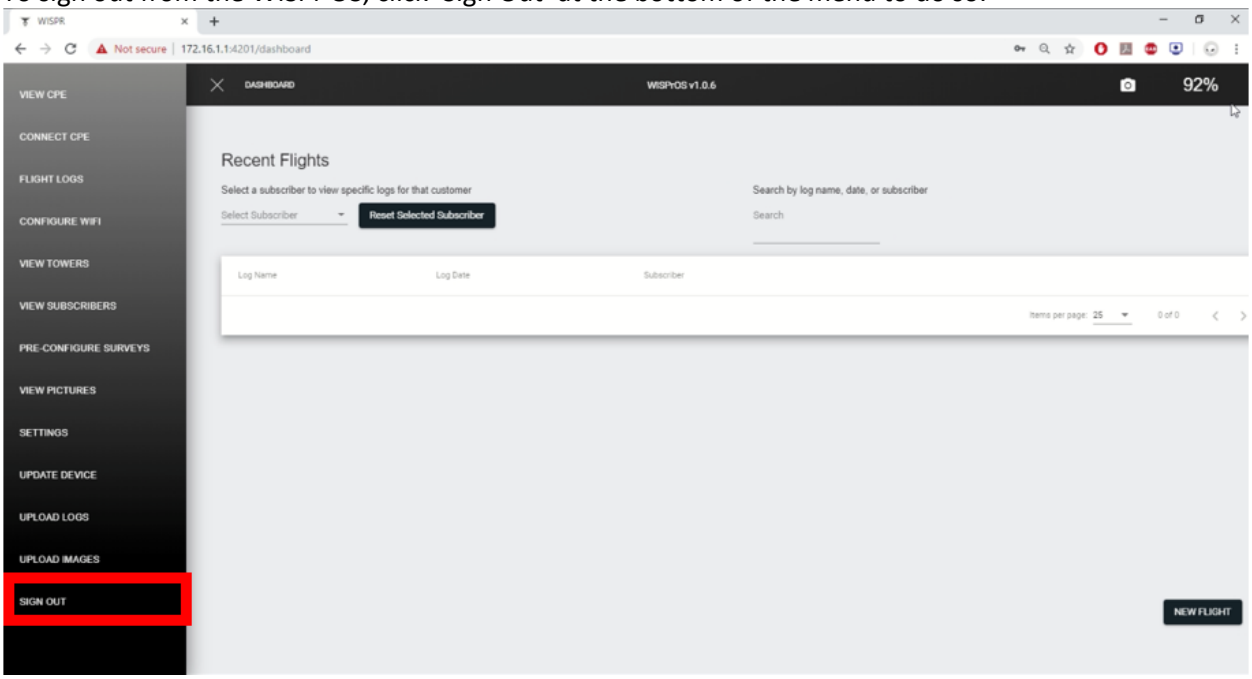
Sign Out

To sign out from the WISPr OS, click ‘Sign Out’ at the bottom of the menu to do so.



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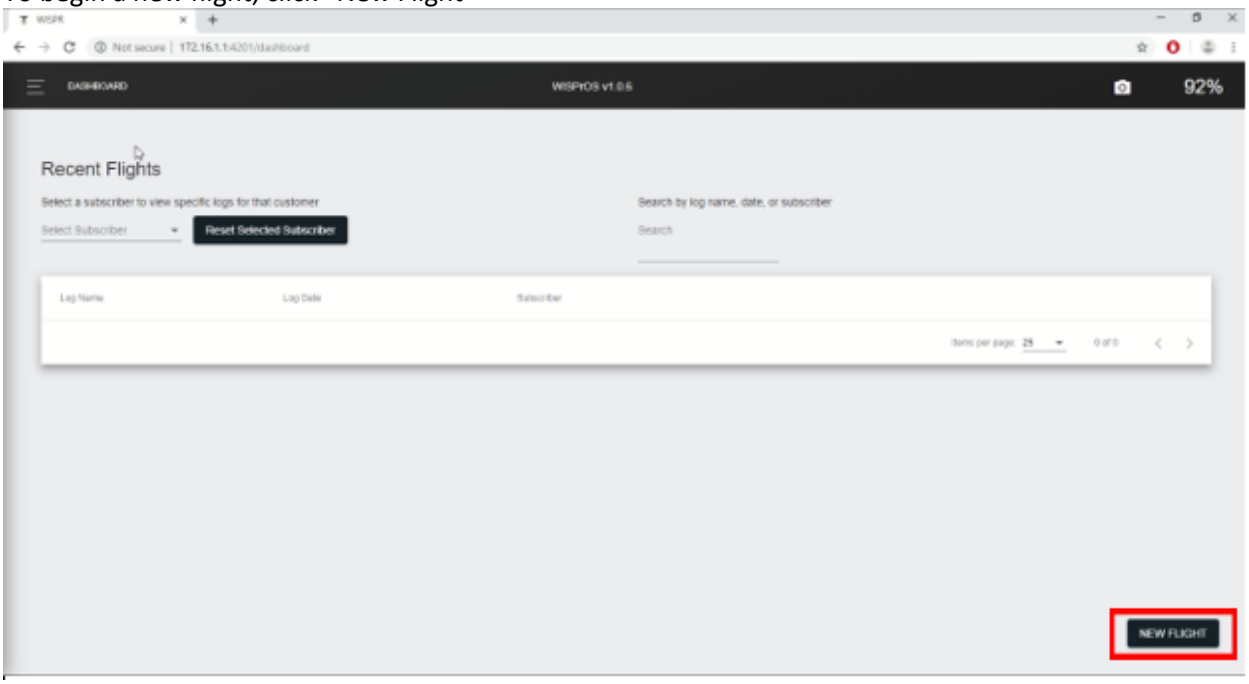
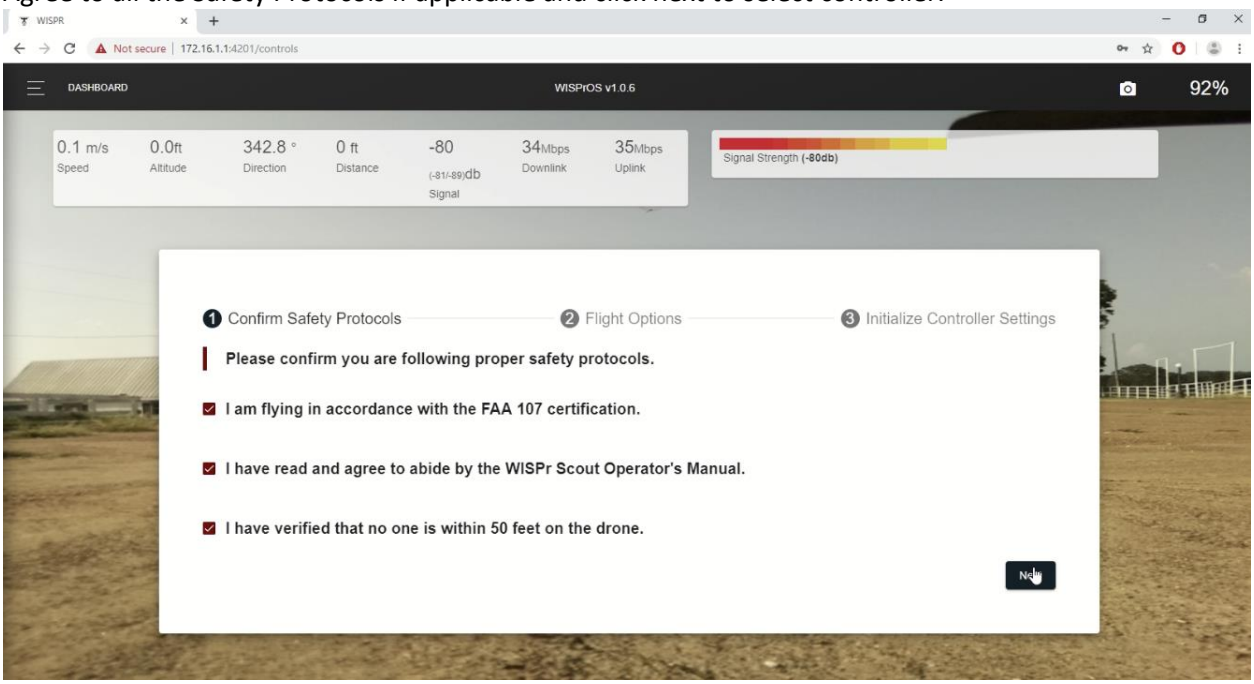
New Flight

To begin a new flight, click “New Flight”



Agree to all the Safety Protocols if applicable and click next to select controller.



⚠ By selecting the boxes in the Safety Protocol prompt, the user is stating that all protocols created by the FAA and WISPr Systems are being followed.

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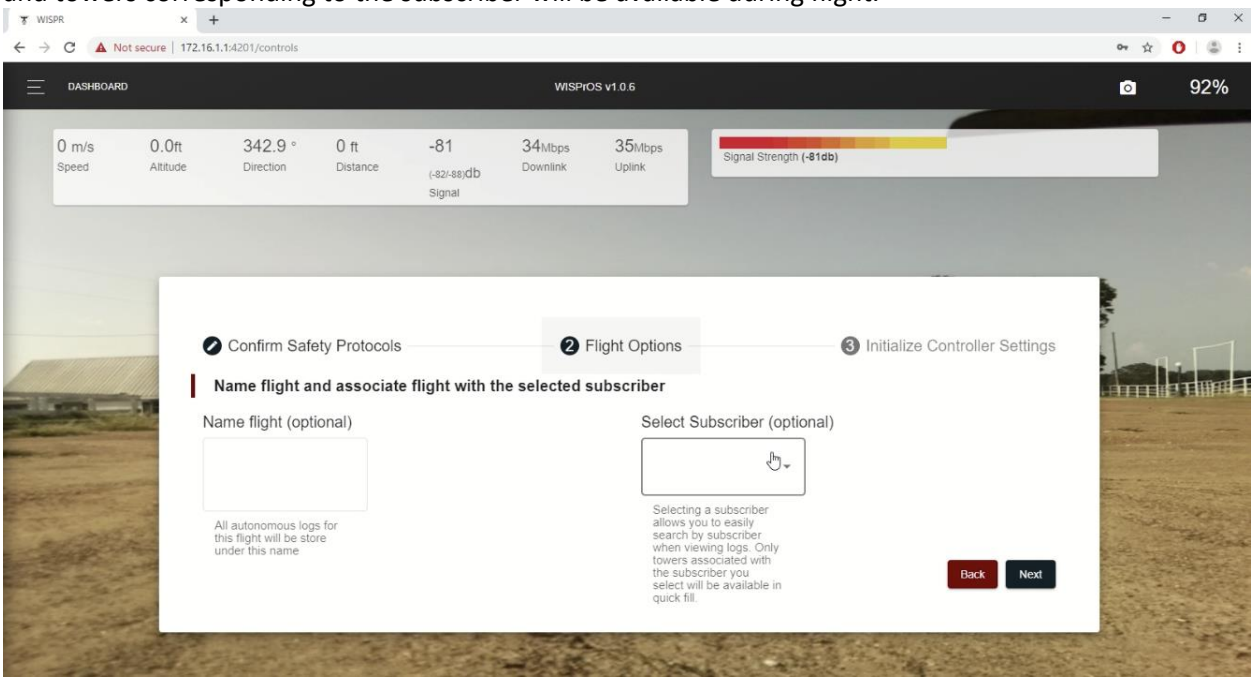
You can name the flight to easily find a survey or log during and after flight. To use pre-configured surveys pre-configured for a new subscriber, select the subscribers name and pre-configured surveys and towers corresponding to the subscriber will be available during flight.



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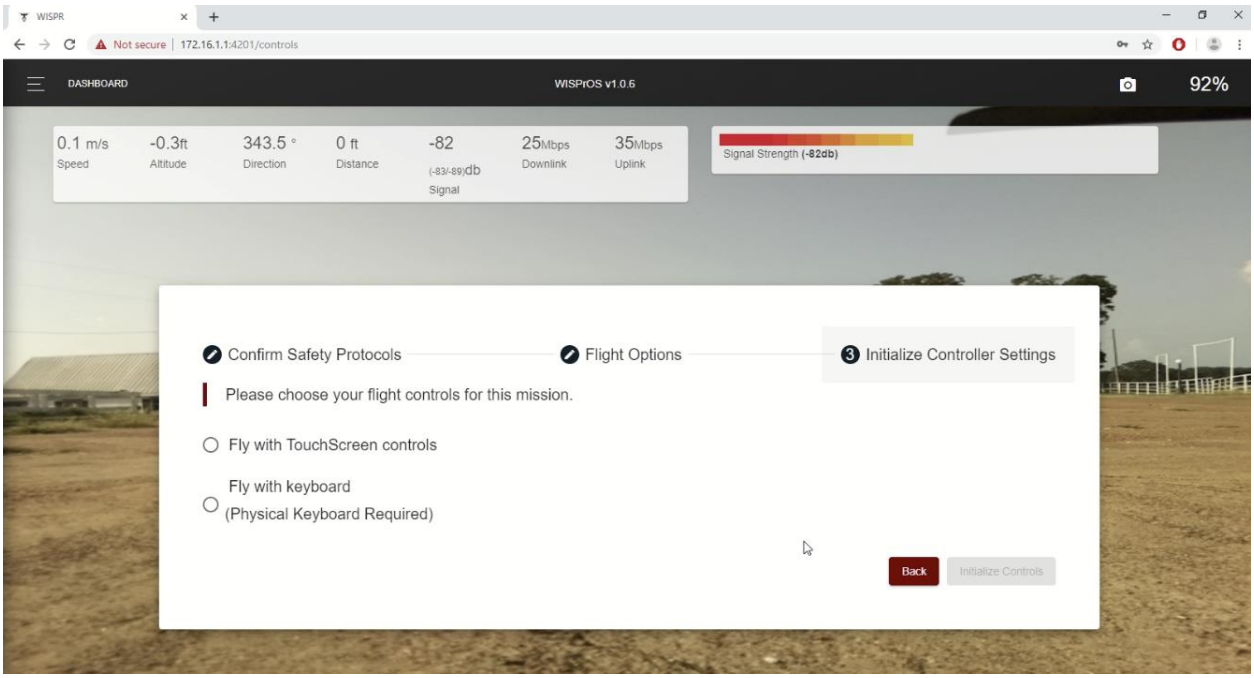
Initialize Hand Controls

There are two ways to control the WISPr Drone, by a hand controller or laptop keyboard. If you plan to use the wired hand controller, plug it into your computers USB port before opening the WISPr OS.

Plug in the hand controller via USB and ensure solid connection. Press a few random buttons on the controller to initiate the controller on your computer.

⚠ Only use controllers provided by WISPr Systems. Using a third-party controller may cause the drone to behave unexpectedly.
Always inspect the controller for physical damage before use.

When at this screen, touch any button on the hand controller to allow the WISPr OS to see the hand controller.



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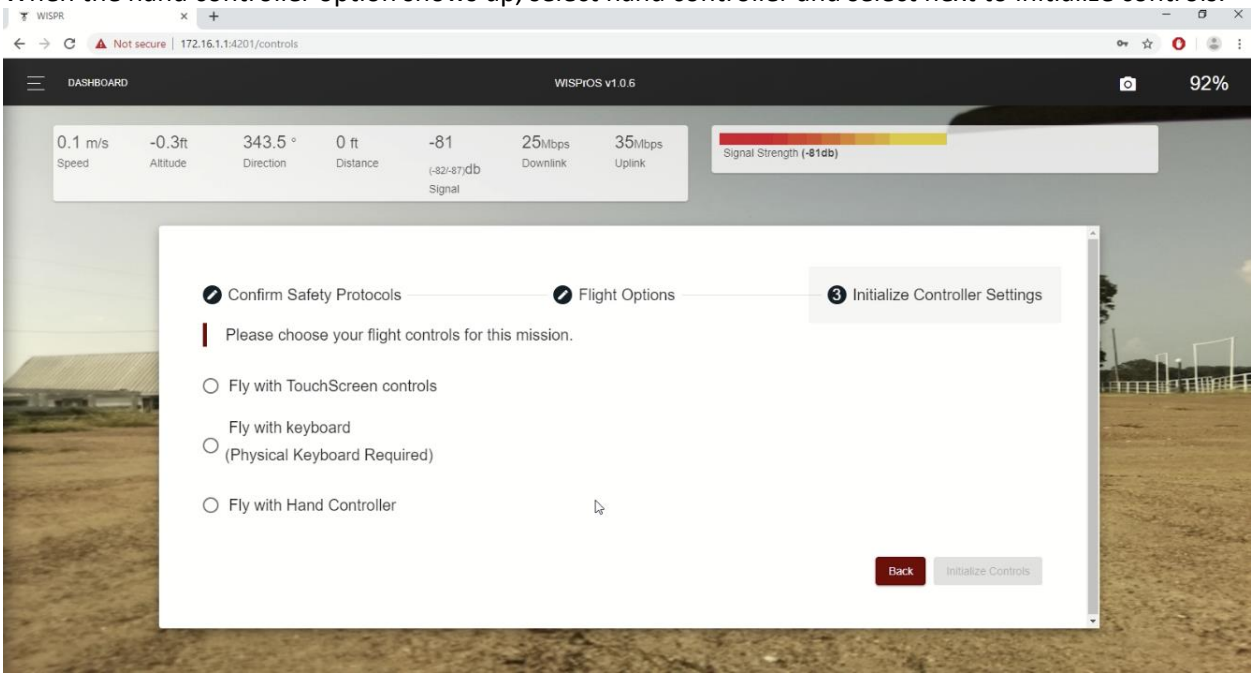
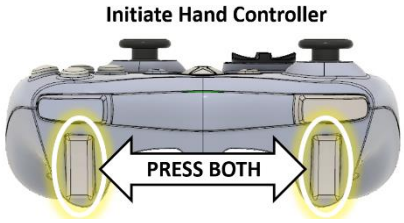
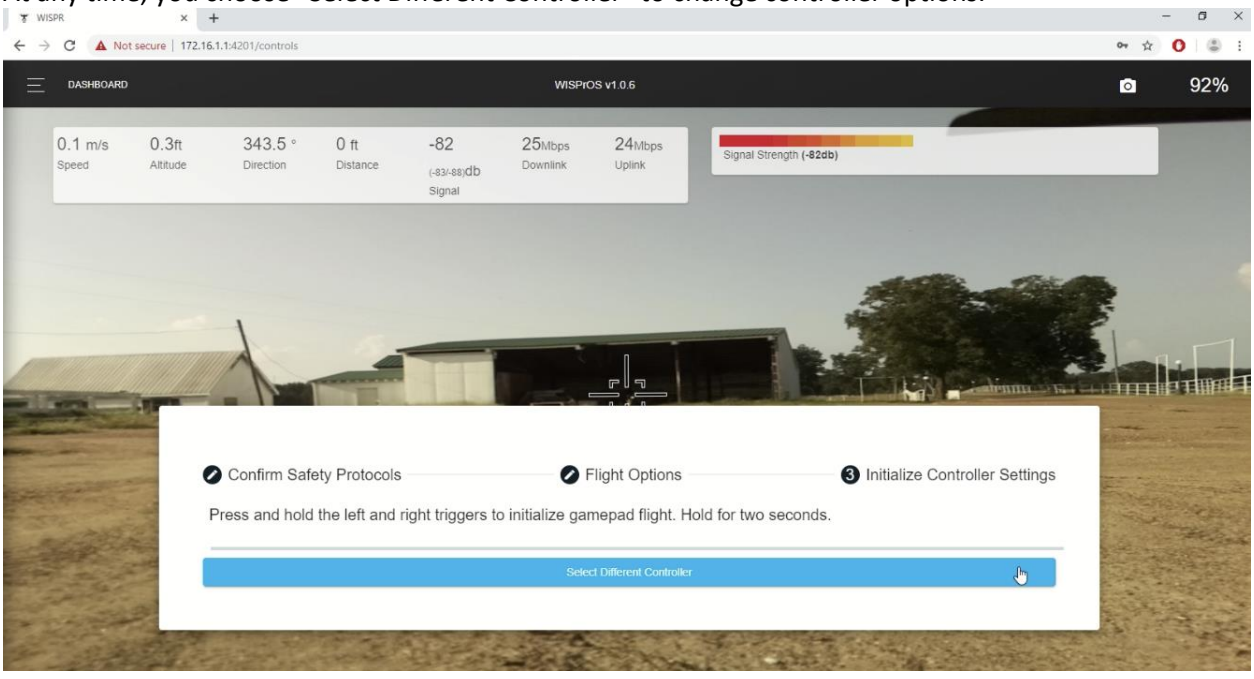
When the hand controller option shows up, select hand controller and select next to initialize controls.



Press the Left and Right triggers for 5 seconds to initialize the hand controller.



At any time, you choose “Select Different Controller” to change controller options.



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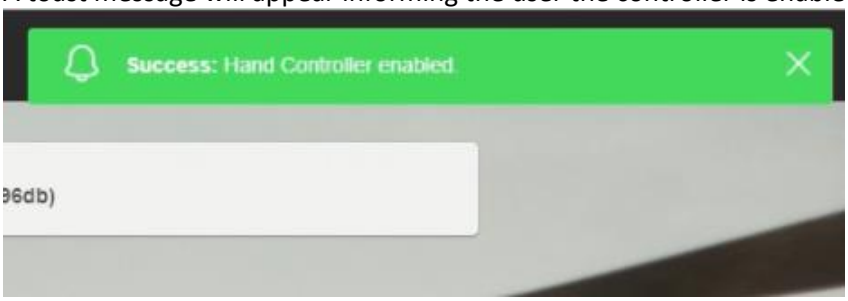
A toast message will appear informing the user the controller is enabled.



If there are any issues with connecting the hand controller, the keyboard option will still work

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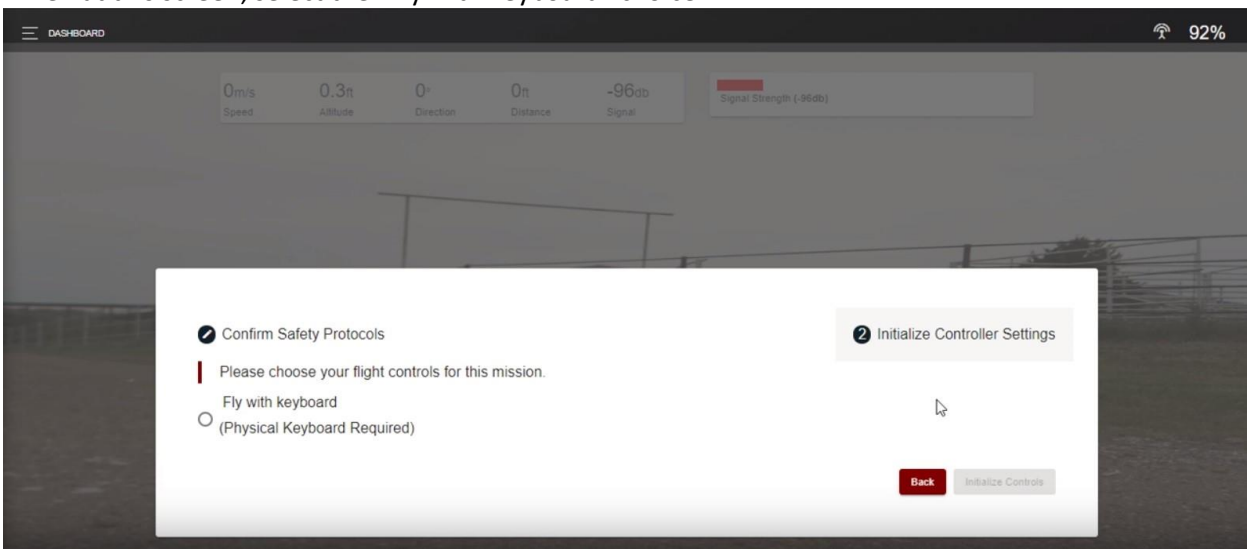
Initialize Keyboard Controls

No connection is needed for the keyboard. If the hand controller fails, the keyboard can always be used as a fall back option.

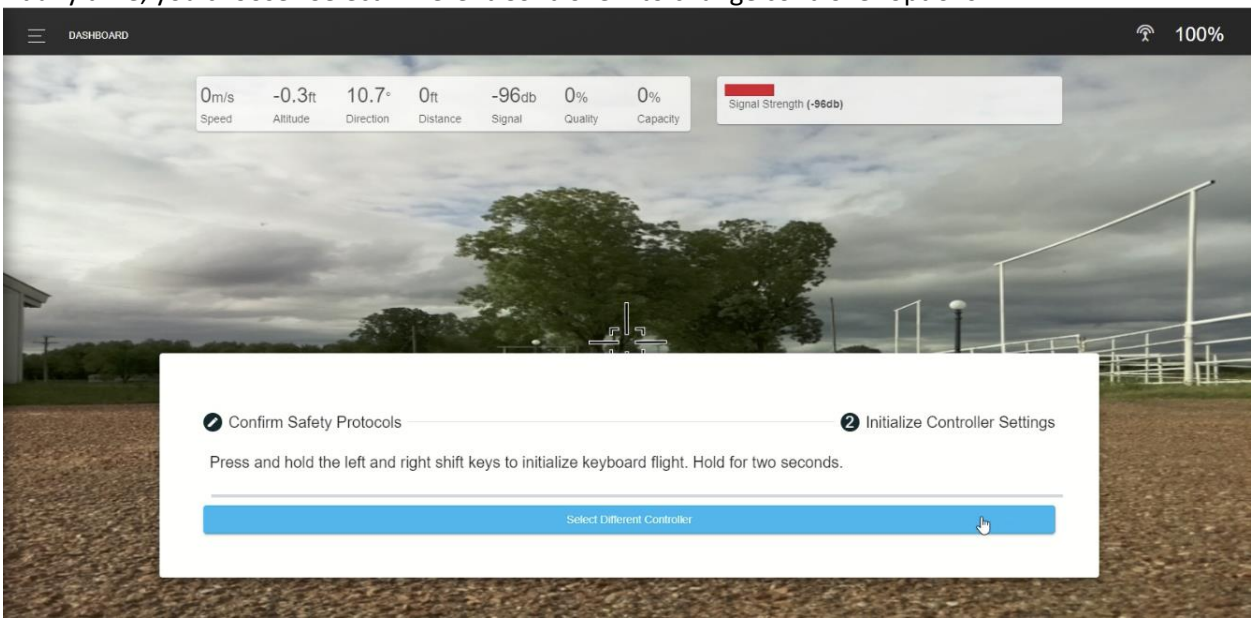
When at this screen, select the “Fly with keyboard” choice.



Press the Left and Right Shift keys for 5 seconds to initialize the keyboard.

Initialize Keyboard

At any time, you choose “Select Different Controller” to change controller options.



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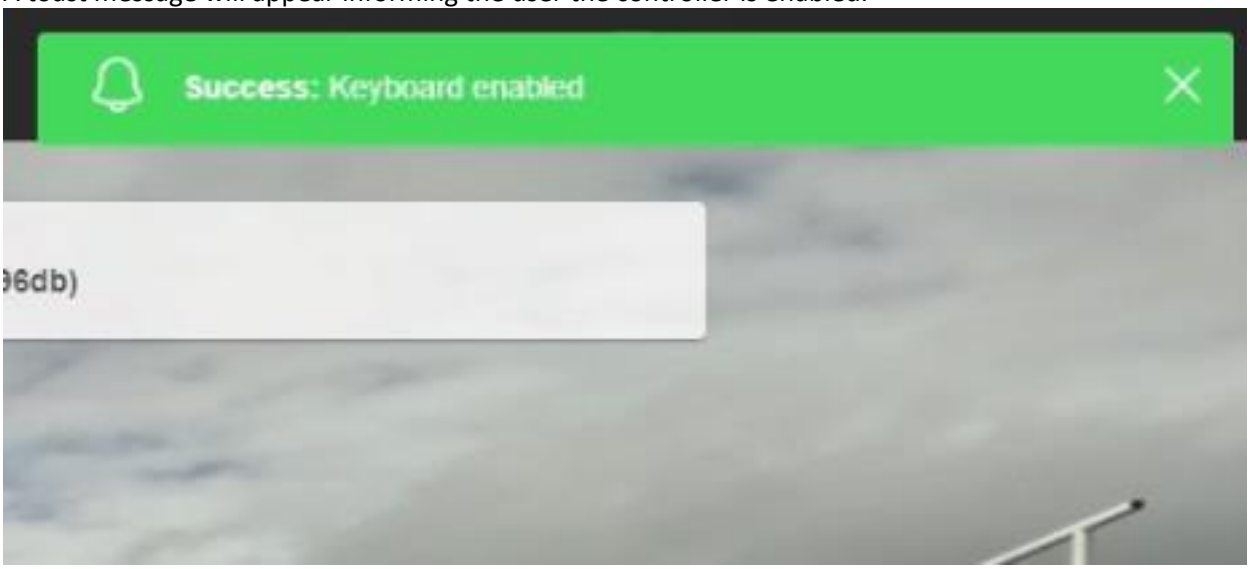
A toast message will appear informing the user the controller is enabled.



If there are any issues with connecting the keyboard, call support.

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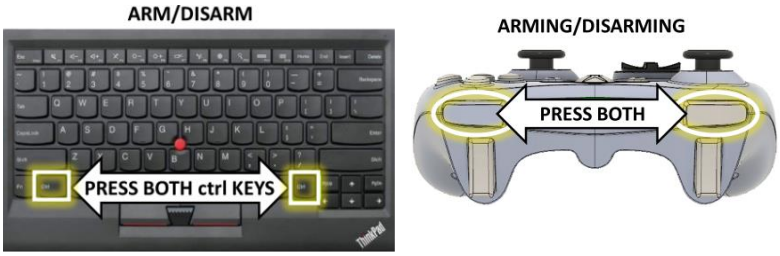
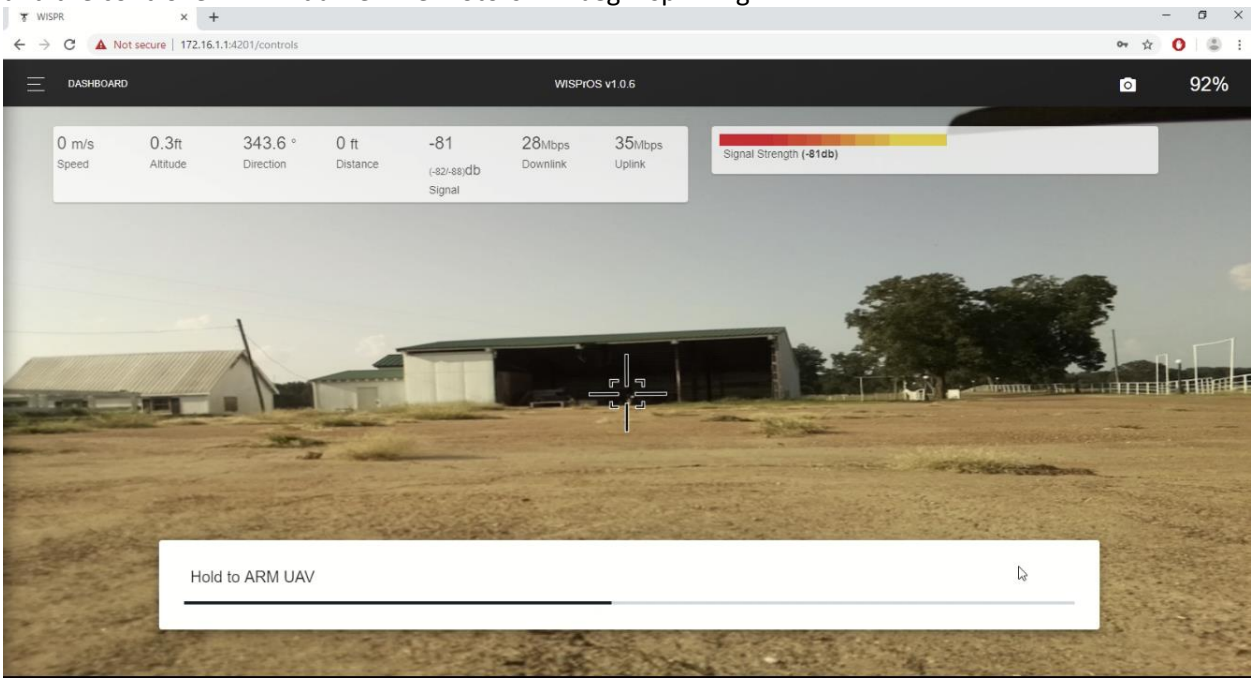
Arming

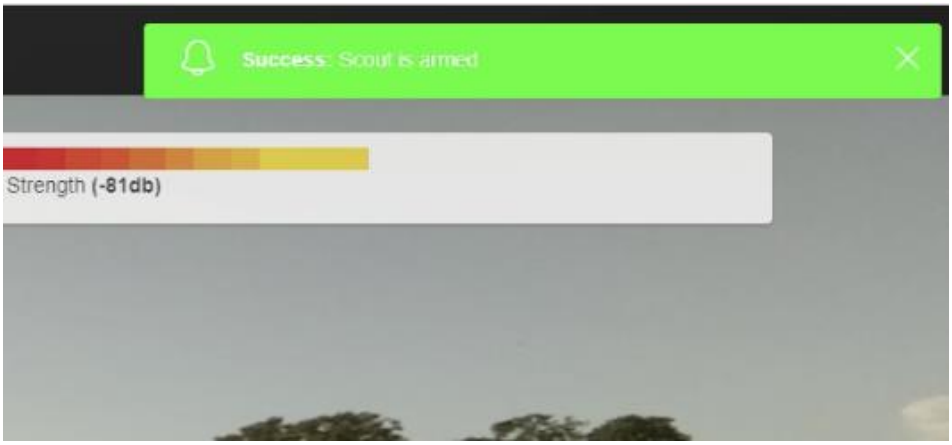
The keyboard or hand controller controls to arm the drone's motors can be seen blow.



While pressing the ctrl keys (KEYBOARD) or bumper buttons (HAND CONTROLLER), a status bar will fill, and the controller will initialize. The motors will begin spinning.



A toast message will appear informing the user the drone is armed.



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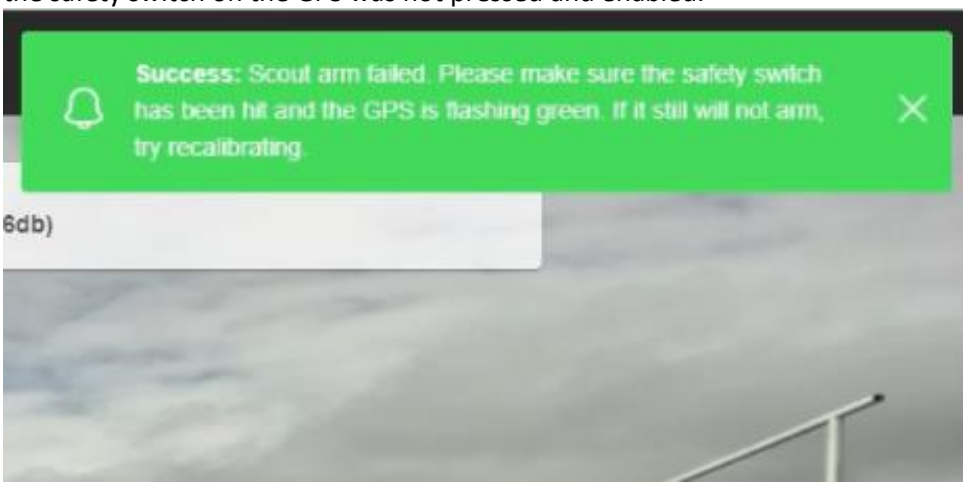
If a message appears informing the user the drone cannot arm, a toast message will appear informing the user why the drone what to check for preventing the drone from arming. Either lack of GPS signal or the safety switch on the GPS was not pressed and enabled.



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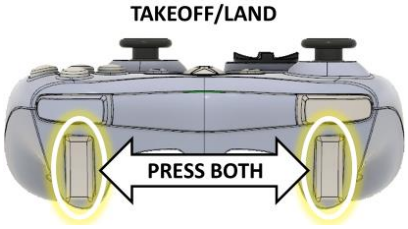
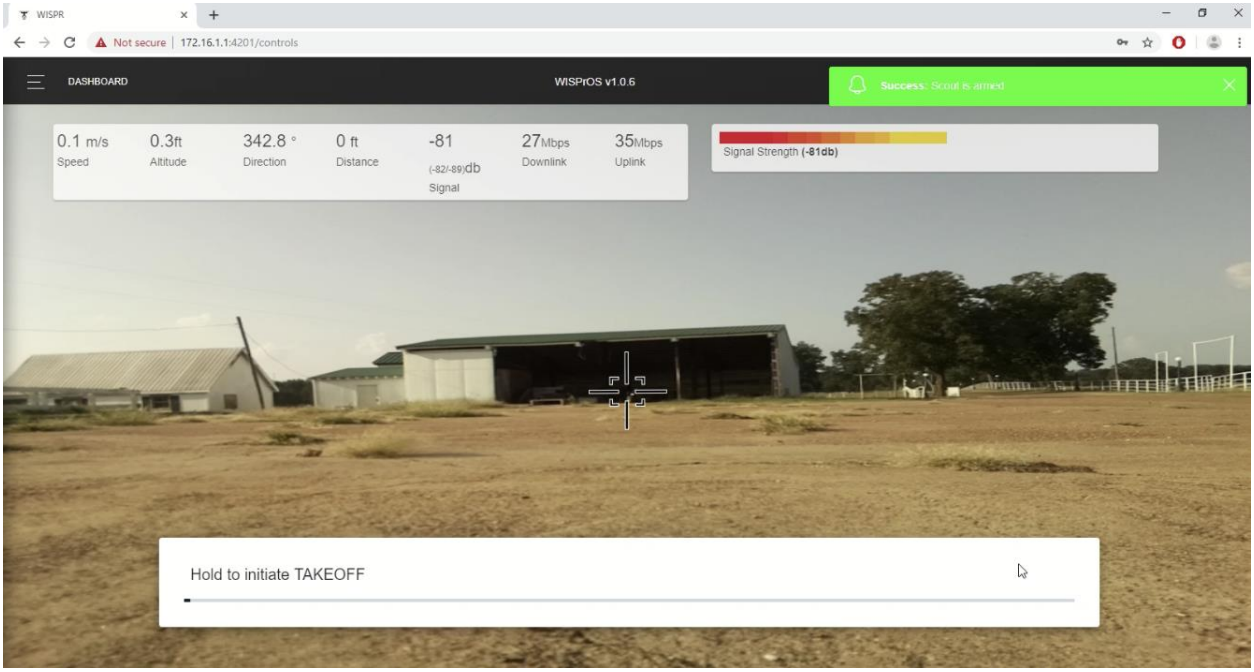
Take-Off

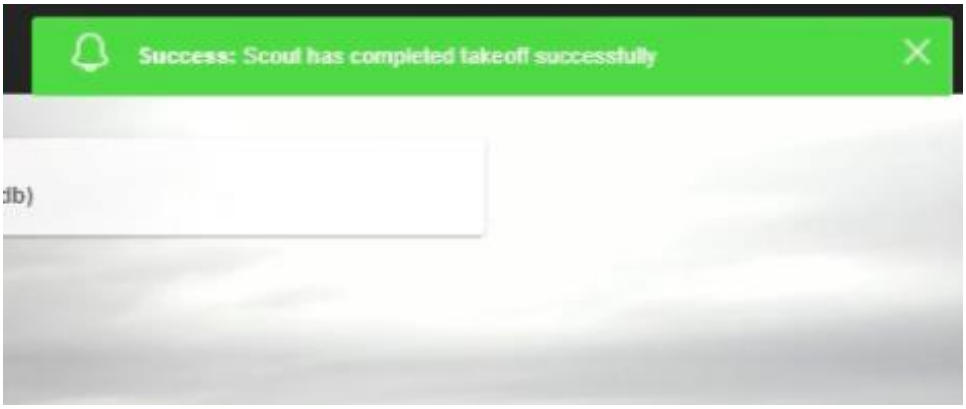
Once the motors are armed the user can take off the drone. At this time, ensure there are no obstacles above the Drone. Take-off is an automated process, which is determined by the controller being used. Take-off controls are seen above in the controls section.



While pressing the shift keys (KEYBOARD) or trigger buttons (HAND CONTROLLER), a status bar will fill, and the controller will initialize. The drone will initiate takeoff. Takeoff is an automated process in which the user will not be able to control the drone until after takeoff was successful.



Toast messages appear informing the user the drone has successfully taken off.



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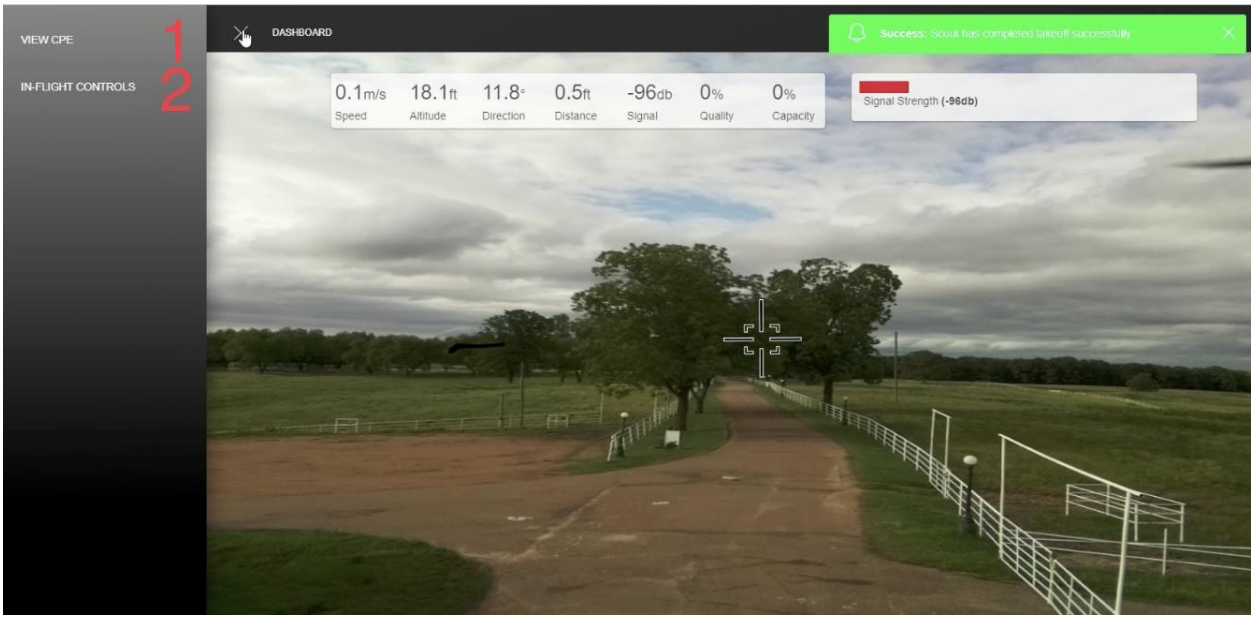
Main Menu (In-Flight)

1. View CPE – click to log directly into the CPE antenna used on the drone.
2. In-Flight Controls – click to use In-flight controls.



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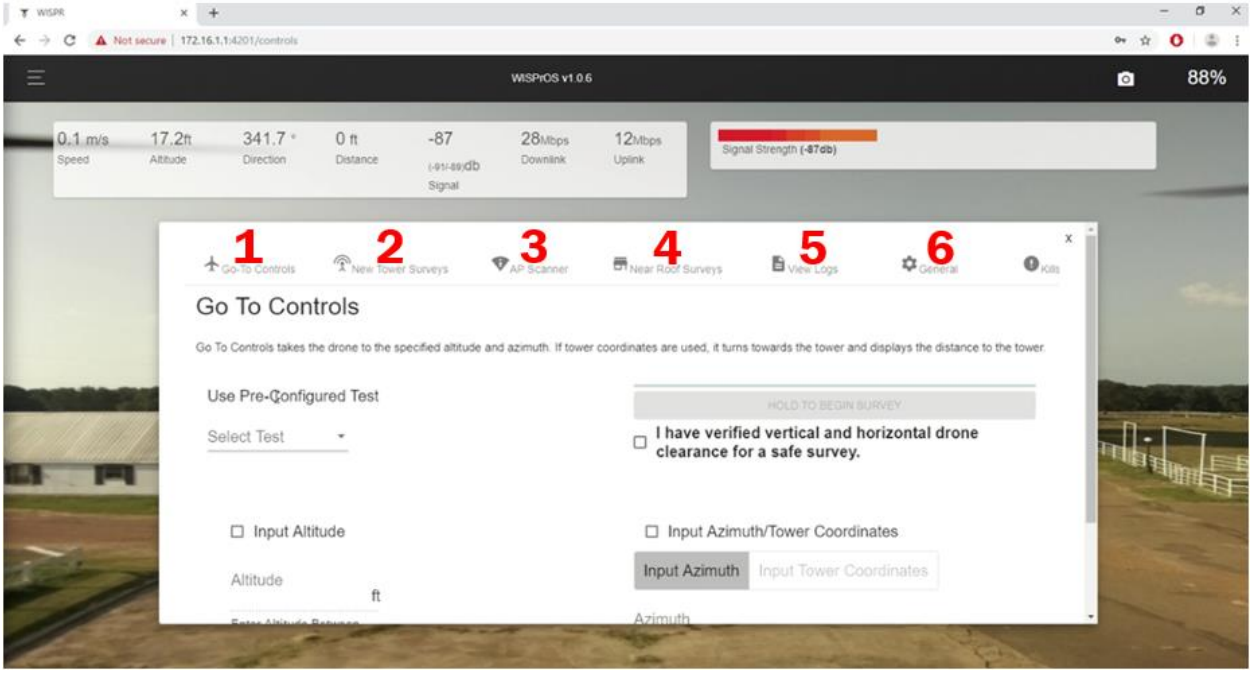
In-Flight Controls

Once the Drone has taken off, “IN-FLIGHT CONTROLS” will be available in the main menu.
From the In-Flight Controls you can choose from

1. Go-To Controls
2. New Tower Survey
3. AP Scanner
4. New Roof Survey
5. View Logs
6. General



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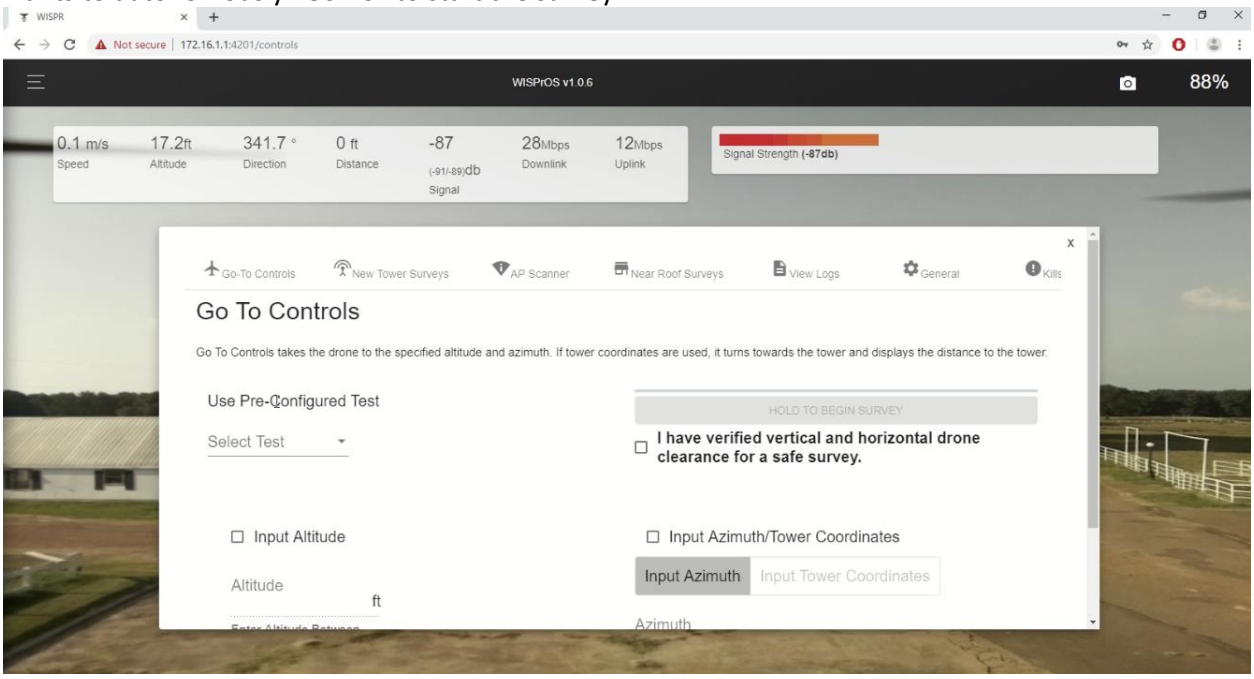
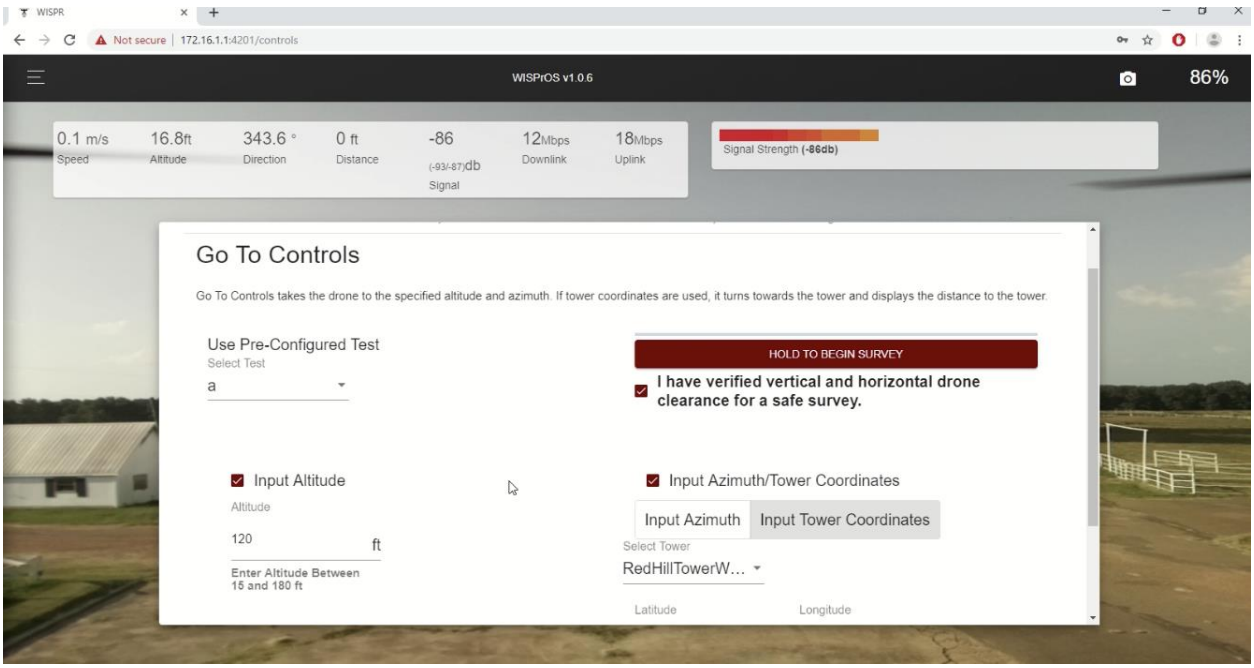
Go-To Controls

The Go-To Controls allow the user to enter an altitude, azimuth/tower coordinates in which the user wants to autonomously “Go-To” to start the survey.



Go-to Options

1. Use Pre-configured Survey – run a pre-configured survey saved to the WISPr OS, this will autofill the entire survey.
2. Select tower to autofill – Autofill the tower coordinates, which are saved to the WISPr OS.
3. Input altitude – manually input altitude to fly to.
4. Input Azimuth – manually input azimuth to fly to.
5. Input Tower Coordinates – manually input tower coordinates to fly to.



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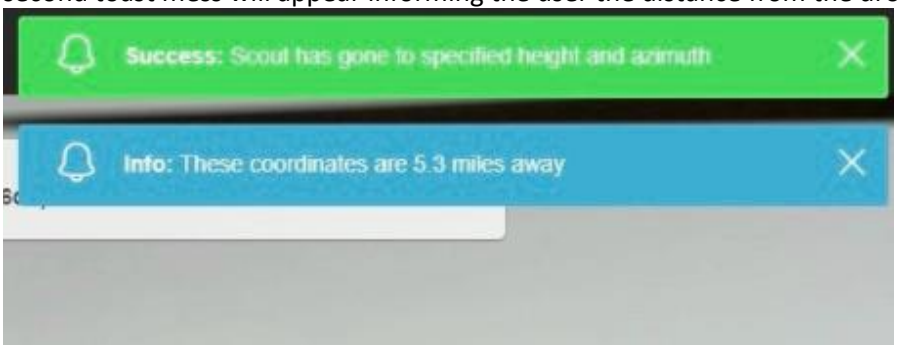
A toast message will appear in the right corner informing the user that the Drone has gone to the desired altitude and azimuth/tower coordinates. If the tower coordinates are used in the Go-To, a second toast mess will appear informing the user the distance from the drone to the tower coordinates.



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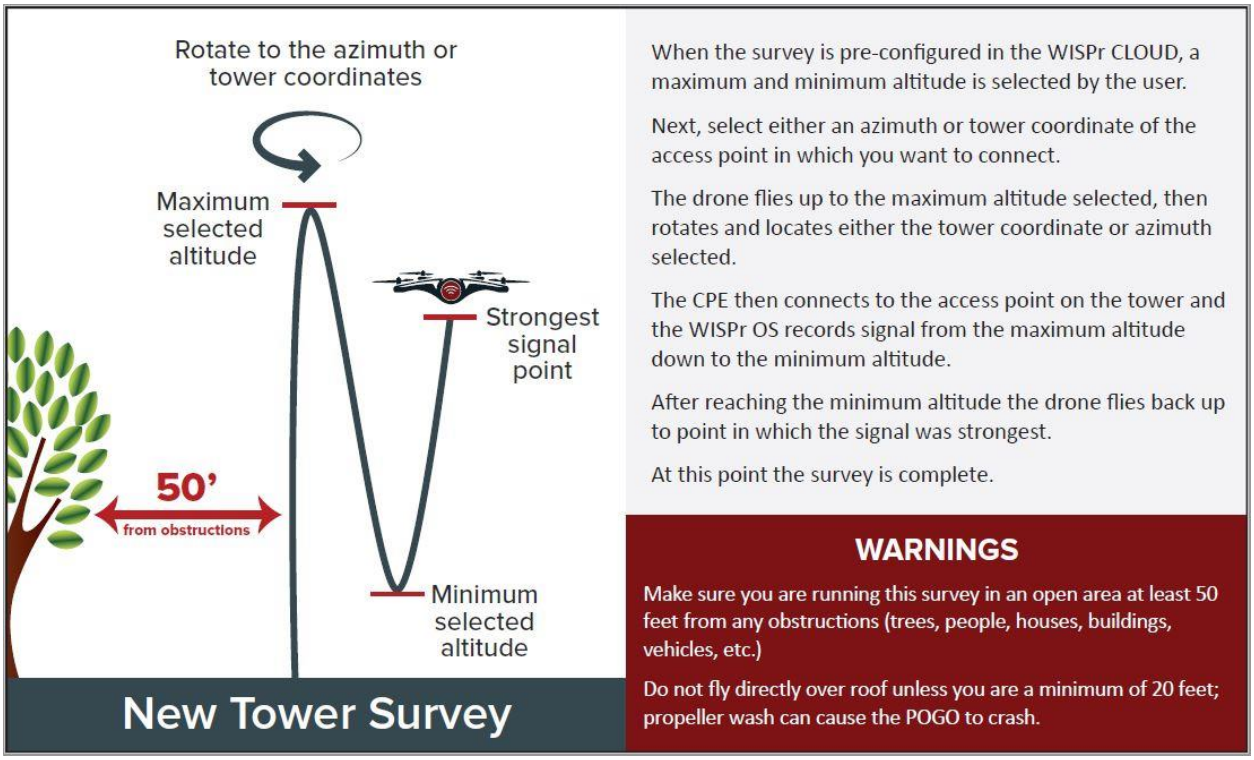
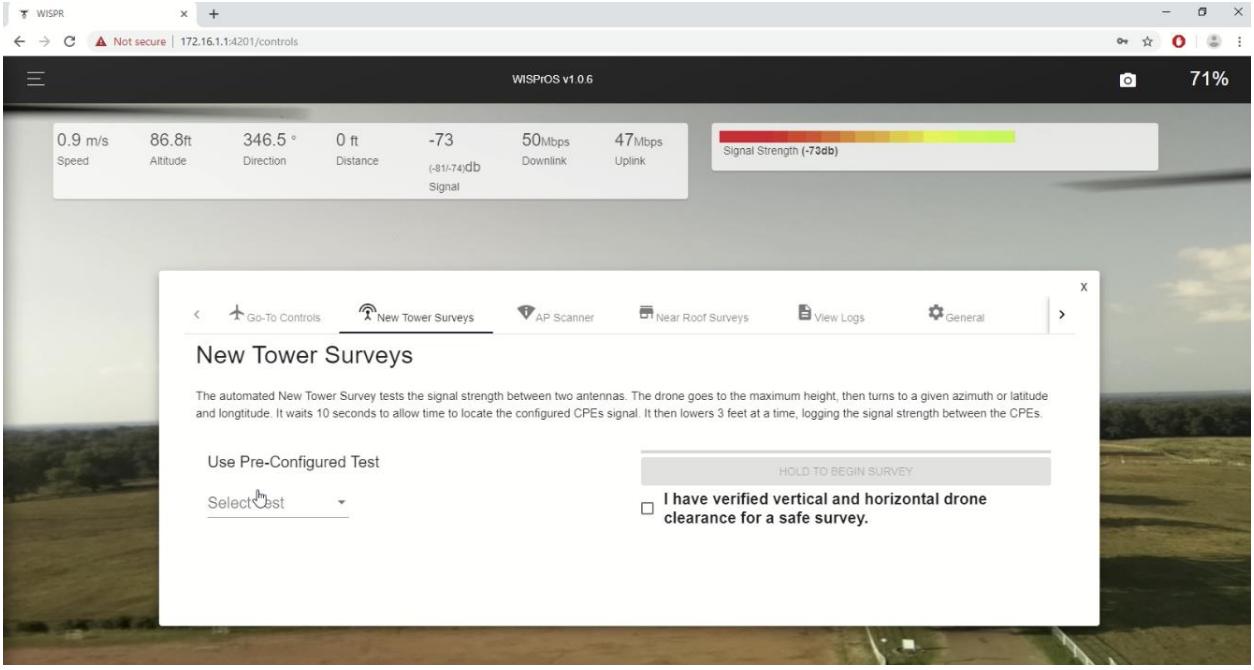
New Tower Surveys

The CPE must have a static LAN address of 192.168.1.20 and the correct channel width, unless the channel width is set to auto.



Select the pre-configured survey then check the vertical and horizontal clearance notifier and hold the button to begin.



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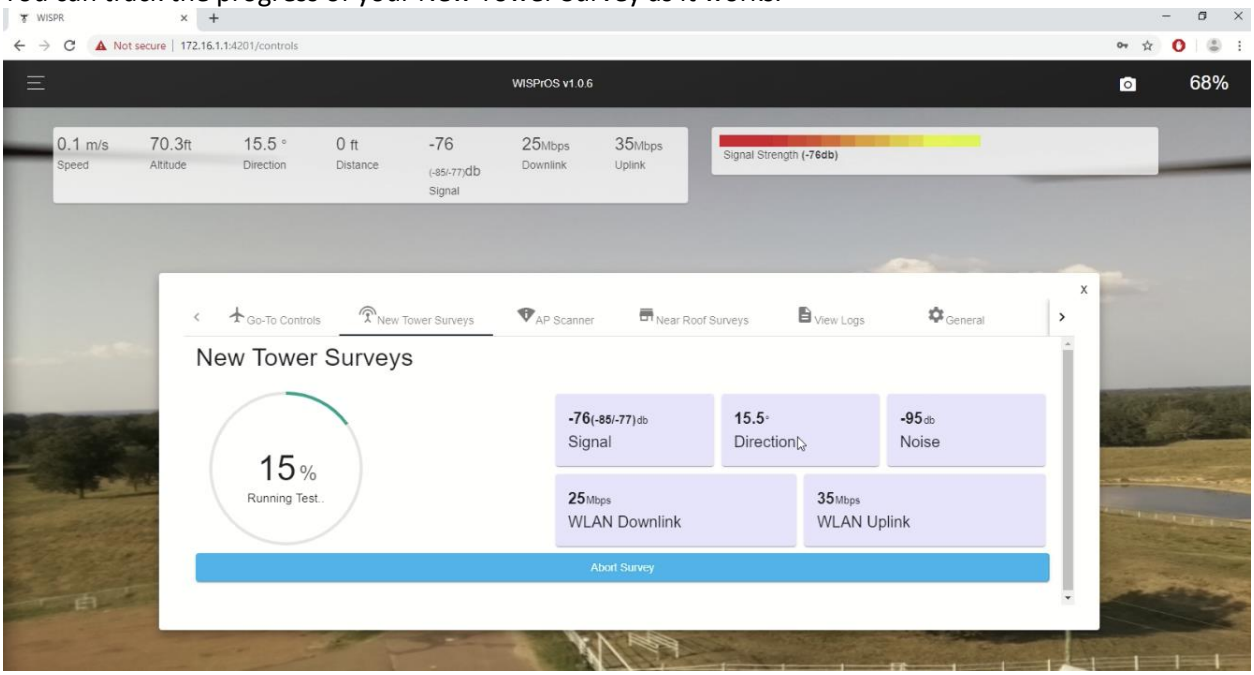
You can track the progress of your New Tower Survey as it works.



If the New Tower Survey does not find signal it will automatically aborted, this means no connection was made with the access point.

Ensure the CPE is configured correctly for use with the WISPr OS, or the survey will not return any useful data. The CPE must have a static LAN address of 192.168.1.20 and the correct channel width, unless the channel width is set to auto.

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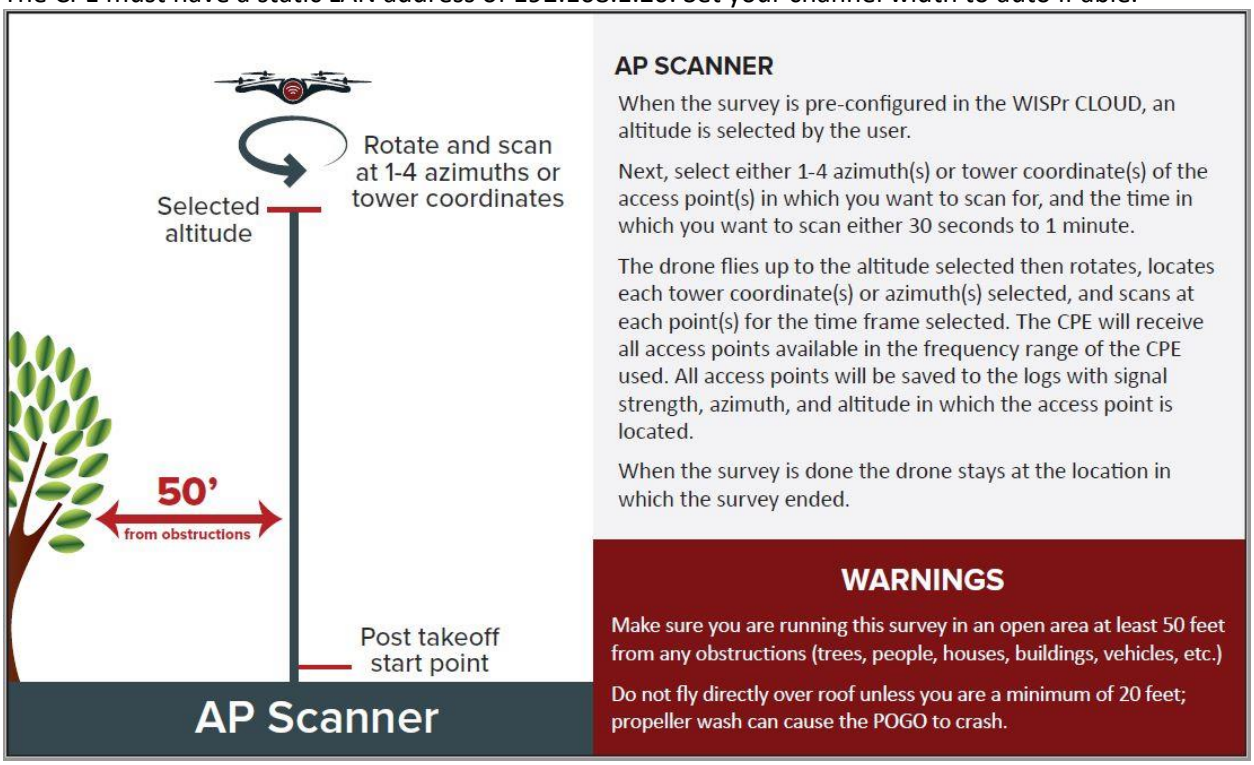
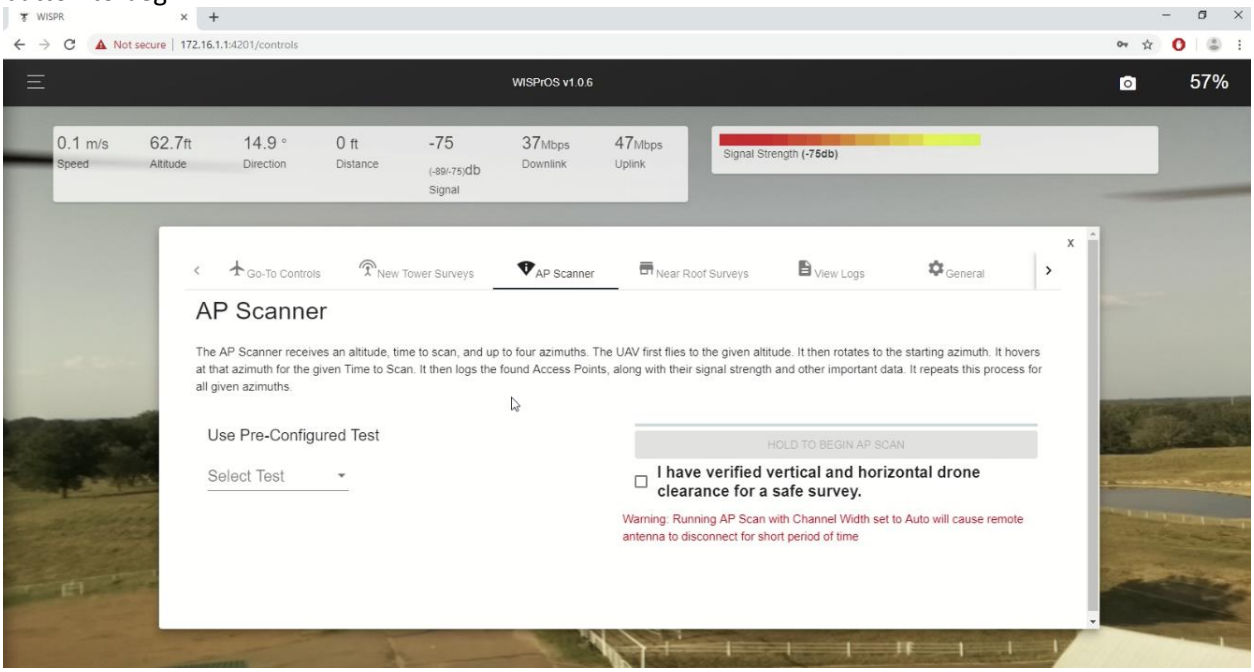
AP Scanner

The CPE must have a static LAN address of 192.168.1.20. Set your channel width to auto if able.



Select the pre-configured survey then check the vertical and horizontal clearance notifier and hold the button to begin



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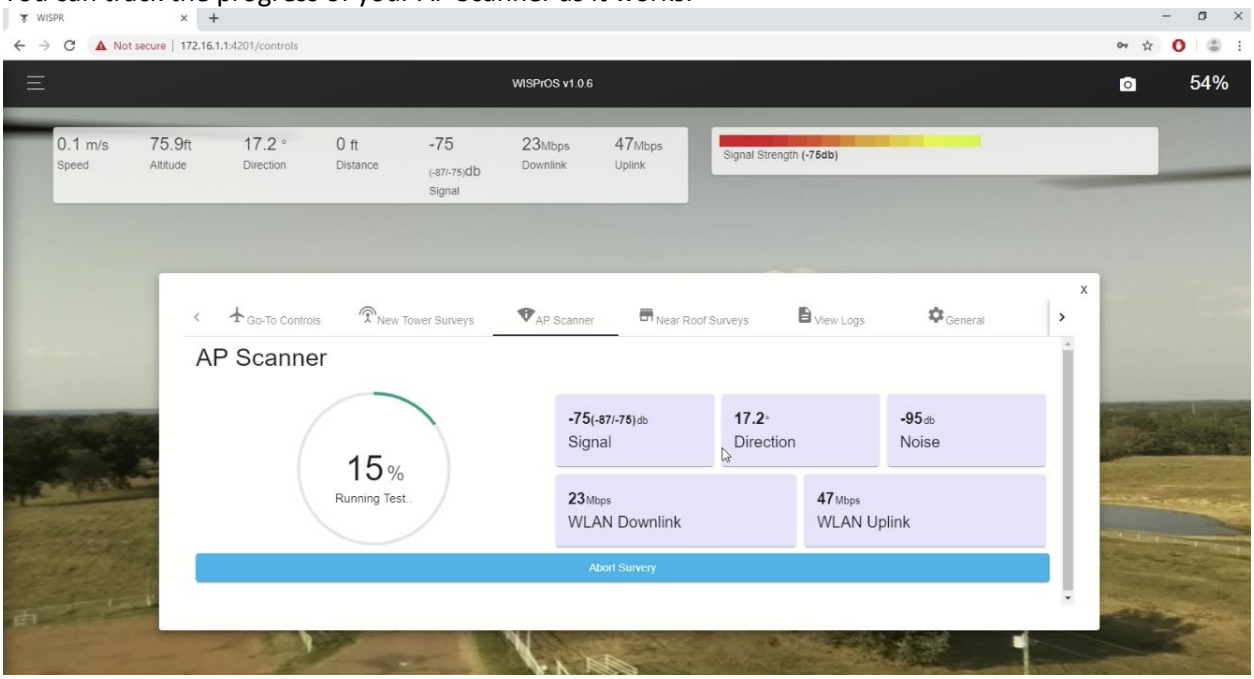
You can track the progress of your AP Scanner as it works.



It is best to do the AP Scanner first before doing a New Tower Survey. This will tell you if your target tower is in range.

The CPE must have a static LAN address of 192.168.1.20. Set your channel width to auto if able.

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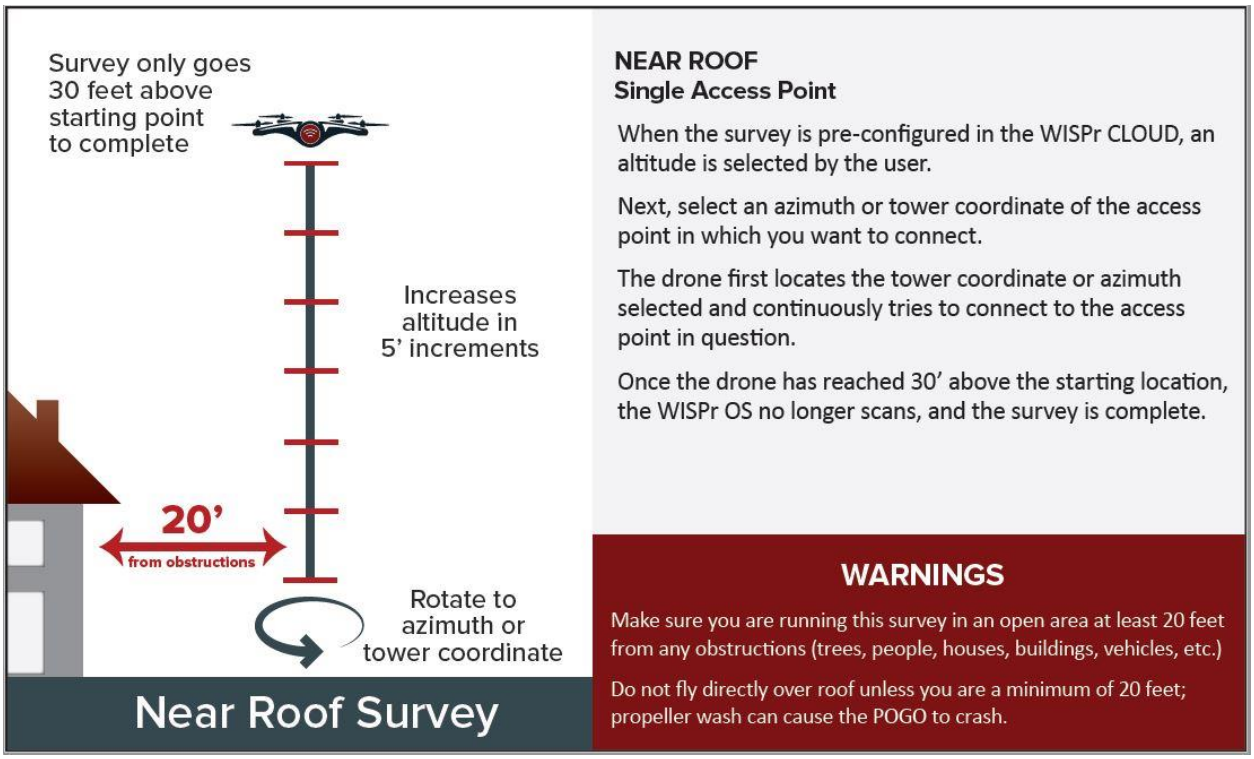
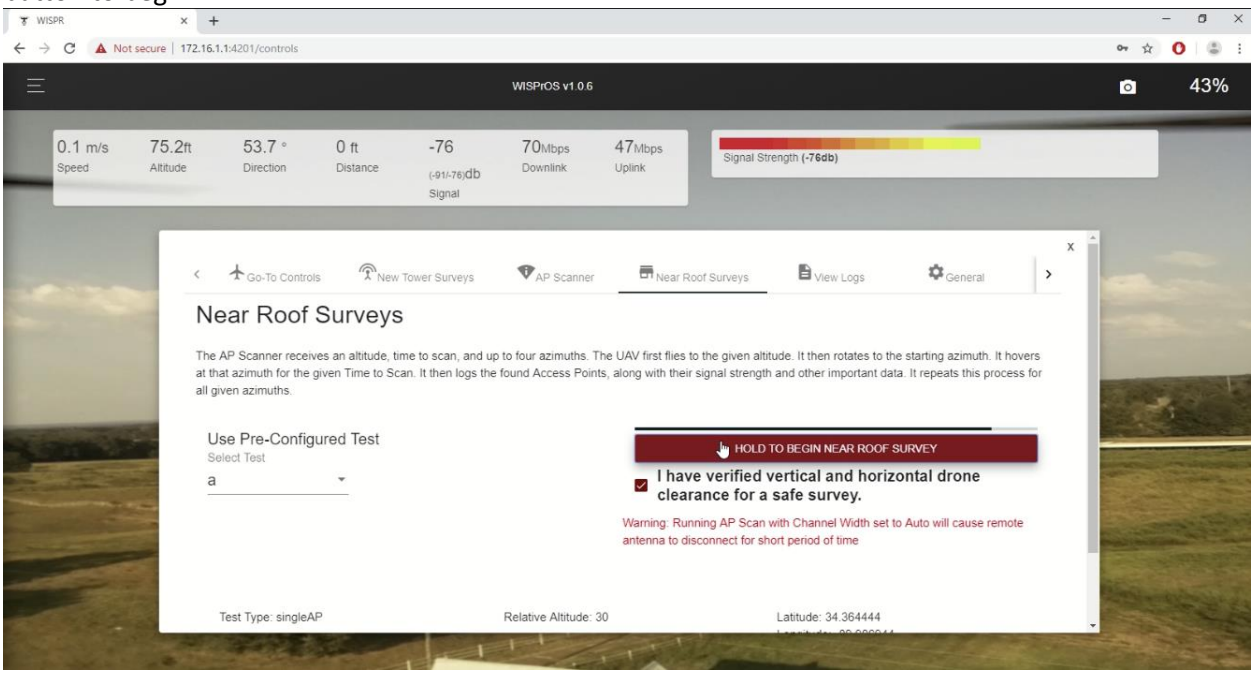
Near Roof Survey – Single Point (New Tower Survey)

The CPE must have a static LAN address of 192.168.1.20 and the correct channel width, unless the channel width is set to auto.



Select the pre-configured survey then check the vertical and horizontal clearance notifier and hold the button to begin.



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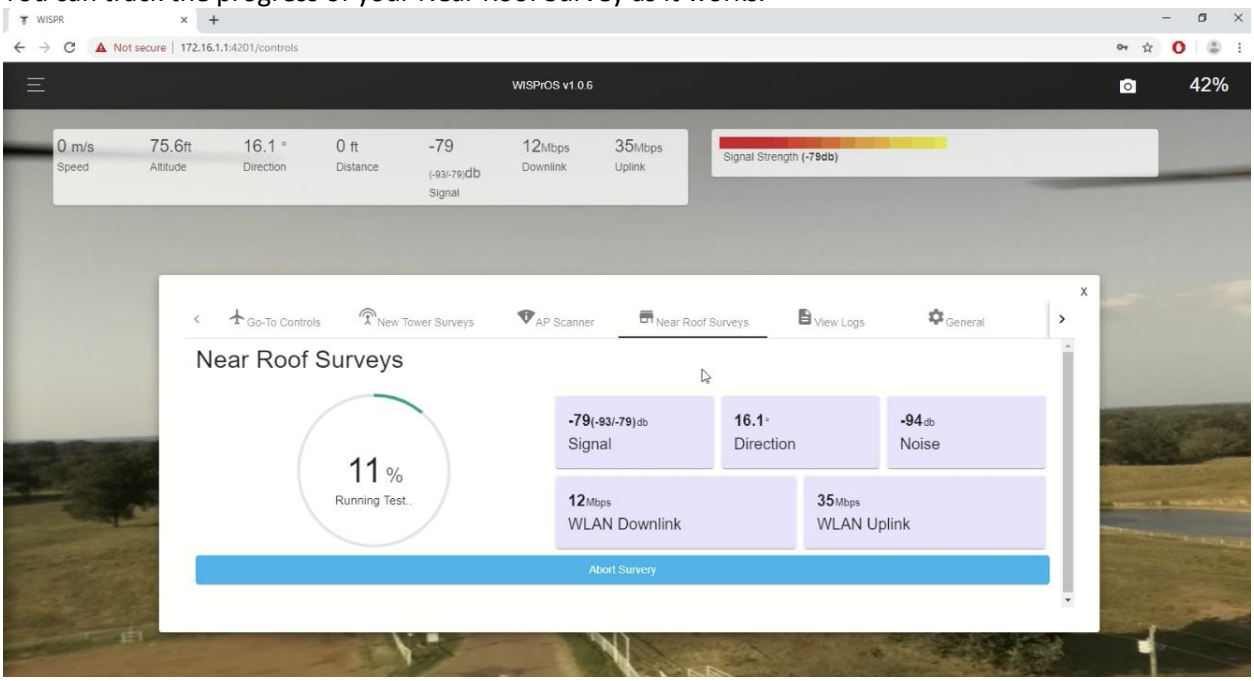
You can track the progress of your Near Roof Survey as it works.



If the New Tower Survey does not find signal it will automatically aborted, this means no connection was made with the access point.

Ensure the CPE is configured correctly for use with the WISPr OS, or the survey will not return any useful data. The CPE must have a static LAN address of 192.168.1.20 and the correct channel width, unless the channel width is set to auto.

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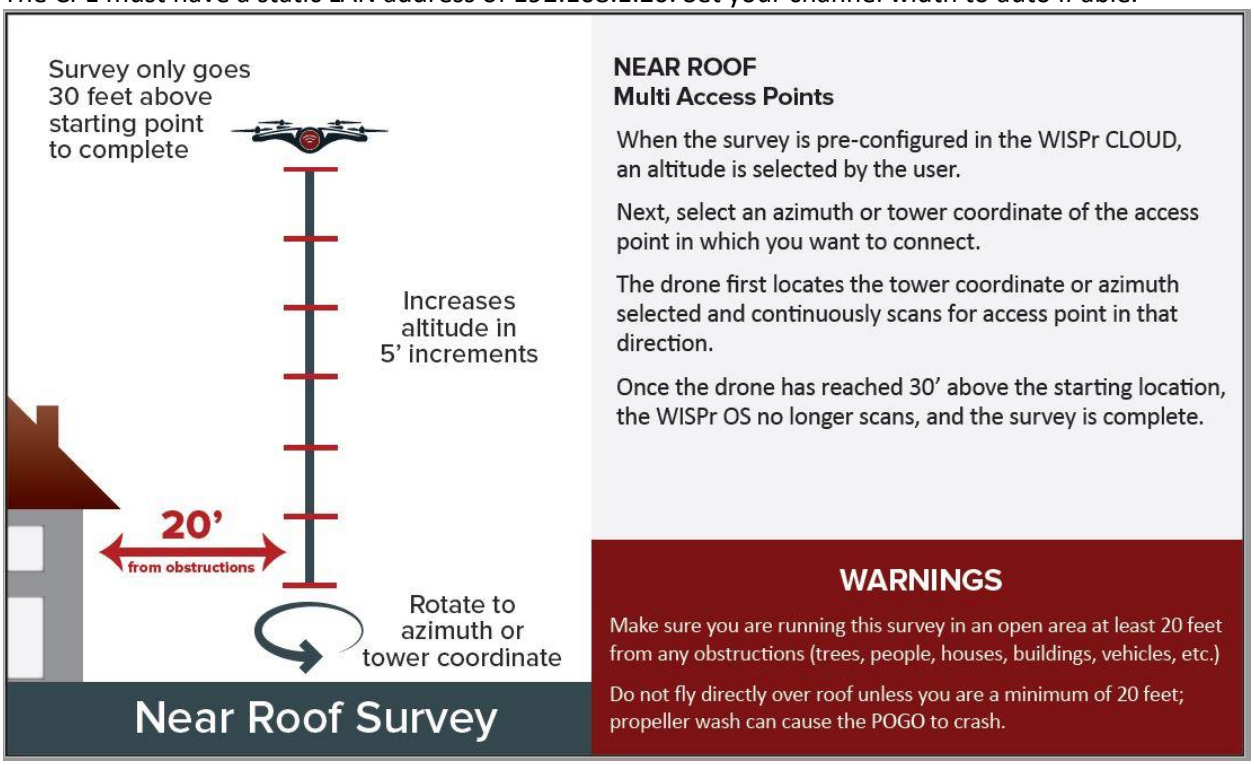
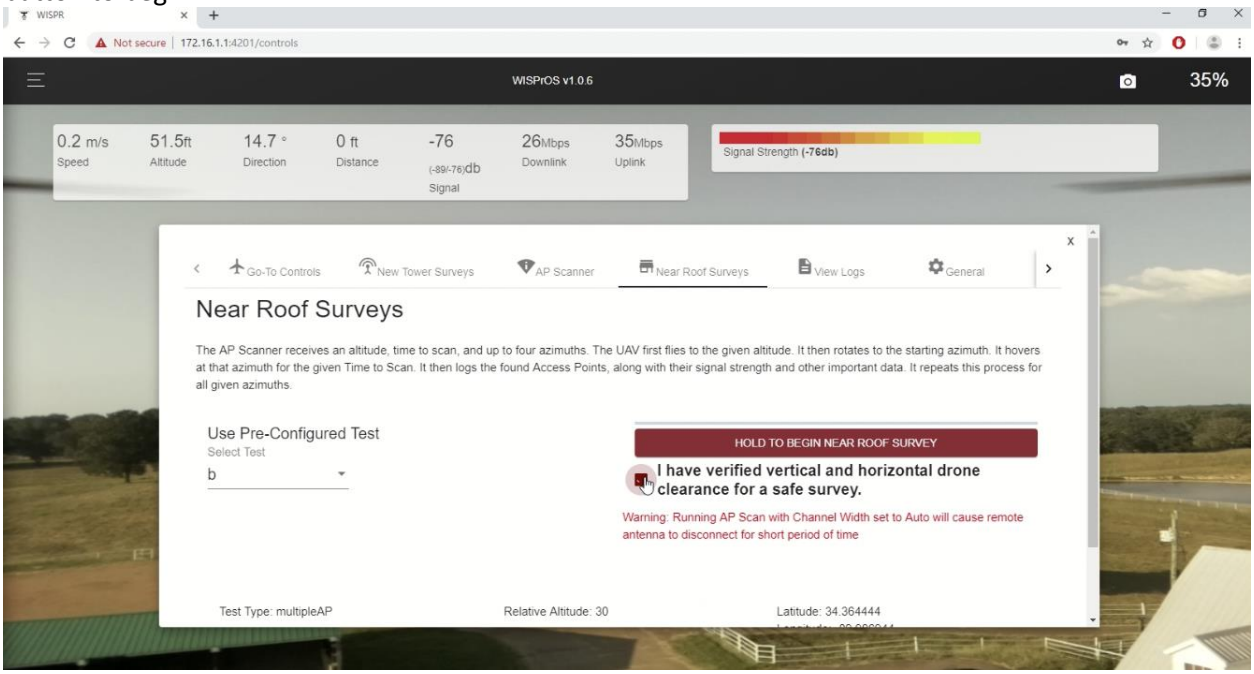
Near Roof Survey – Multipoint (AP Scanner)

The CPE must have a static LAN address of 192.168.1.20. Set your channel width to auto if able.



Select the pre-configured survey then check the vertical and horizontal clearance notifier and hold the button to begin.



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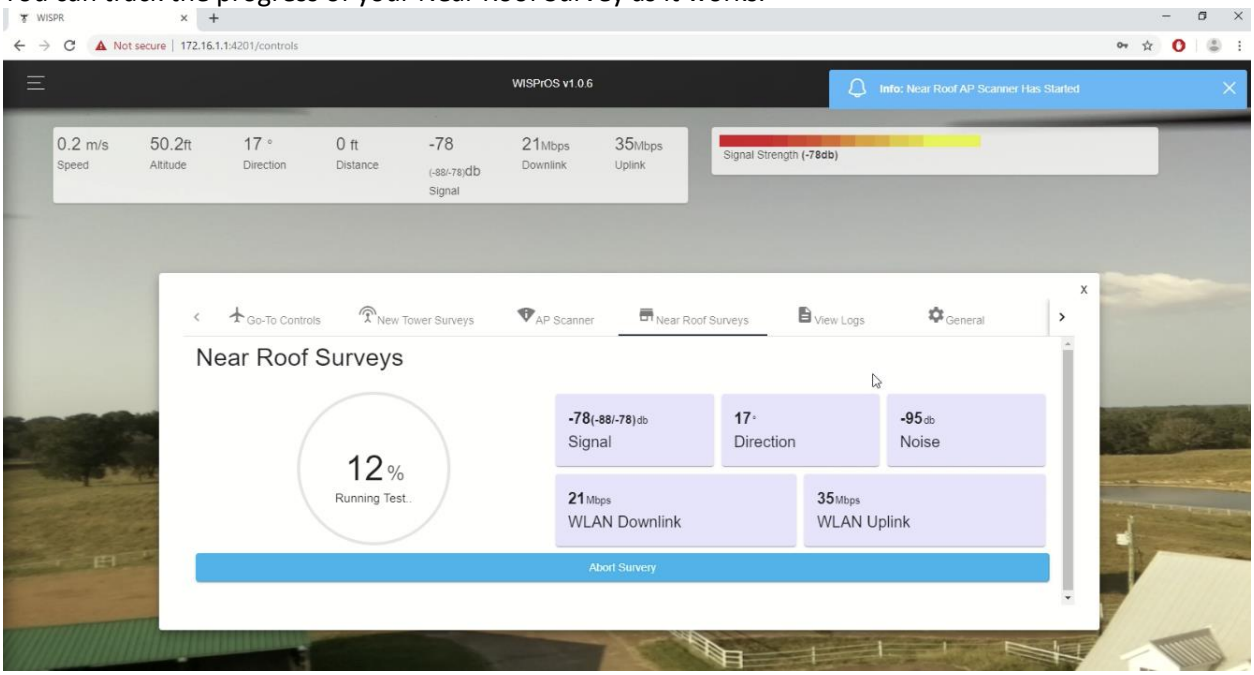
You can track the progress of your Near Roof Survey as it works.



It is best to do the AP Scanner first before doing a New Tower Survey. This will tell you if your target tower is in range.

The CPE must have a static LAN address of 192.168.1.20. Set your channel width to auto if able.

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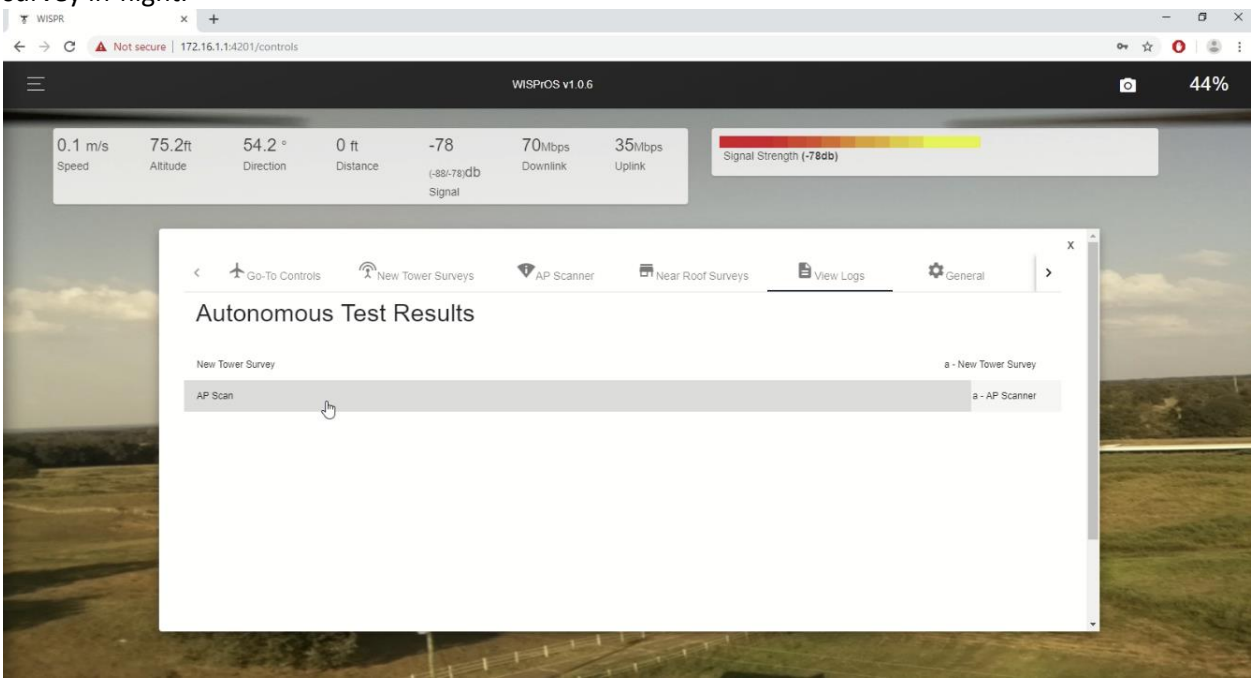
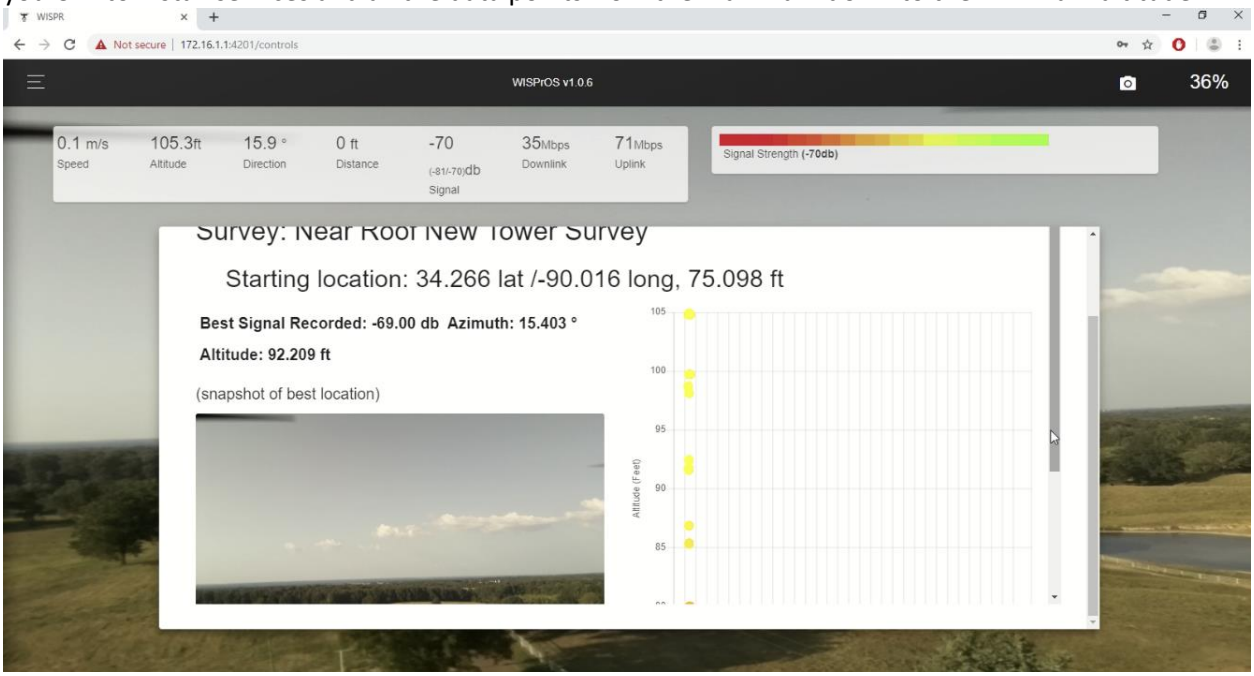
View Logs

New Tower Survey Logs (In-Flight)

Click ‘View Logs’ tab then select the option for the ‘New Tower Survey’ to view logs after running the survey in-flight.



The logs display all the signal points gathered and gives you the best height and the direction to install you CPE to install services and all the data points from the maximum down to the minimum altitude.



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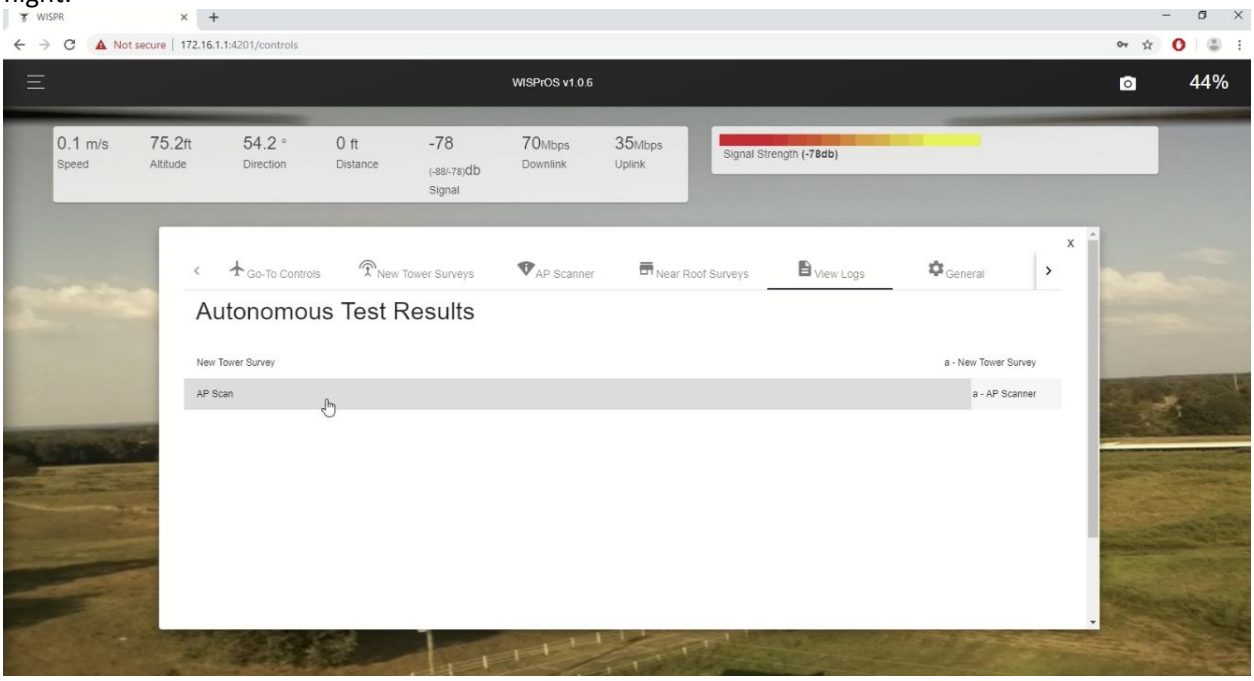
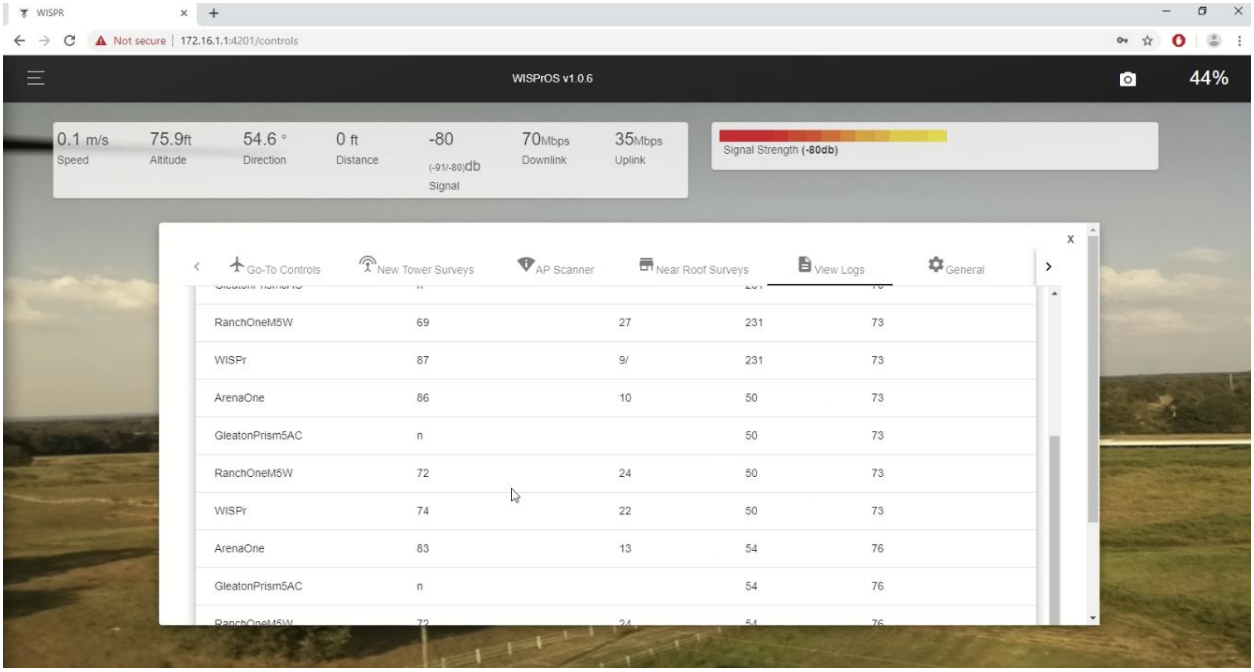
AP Scanner Logs (In-Flight)

Click ‘View Logs’ tab then select the option for the ‘AP Scan’ to view logs after running the survey in-flight.



The logs display all the access points available for possible connection points to provide services at one altitude.



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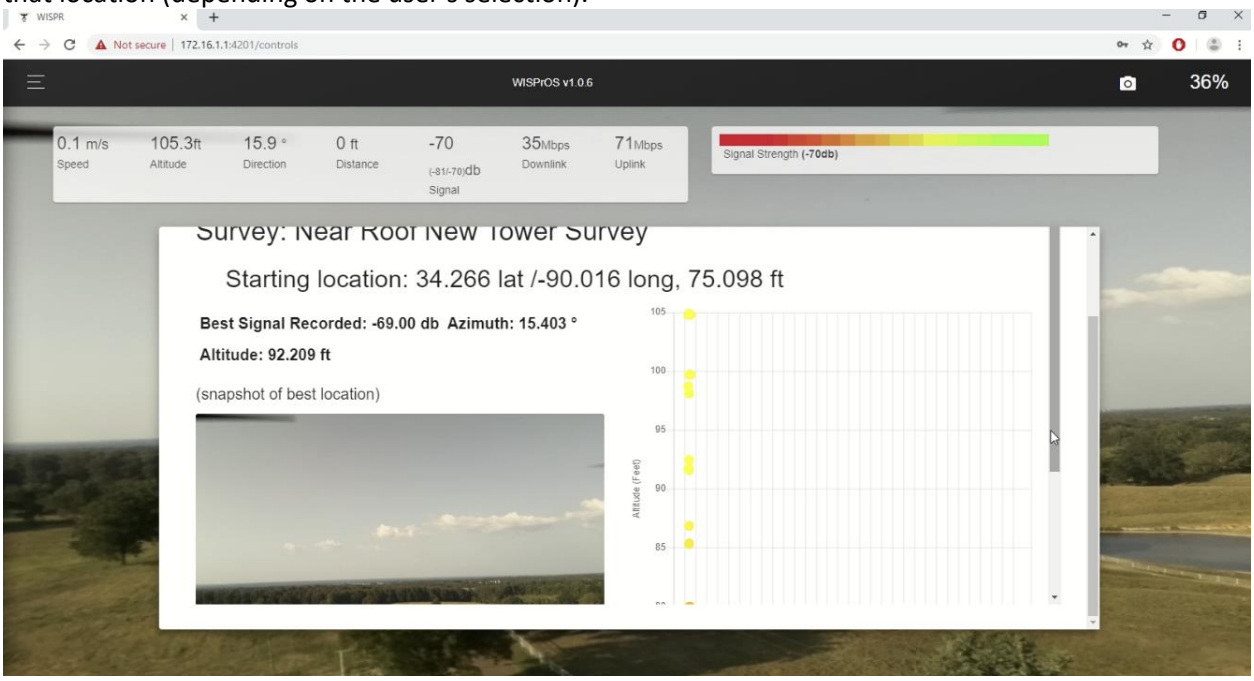
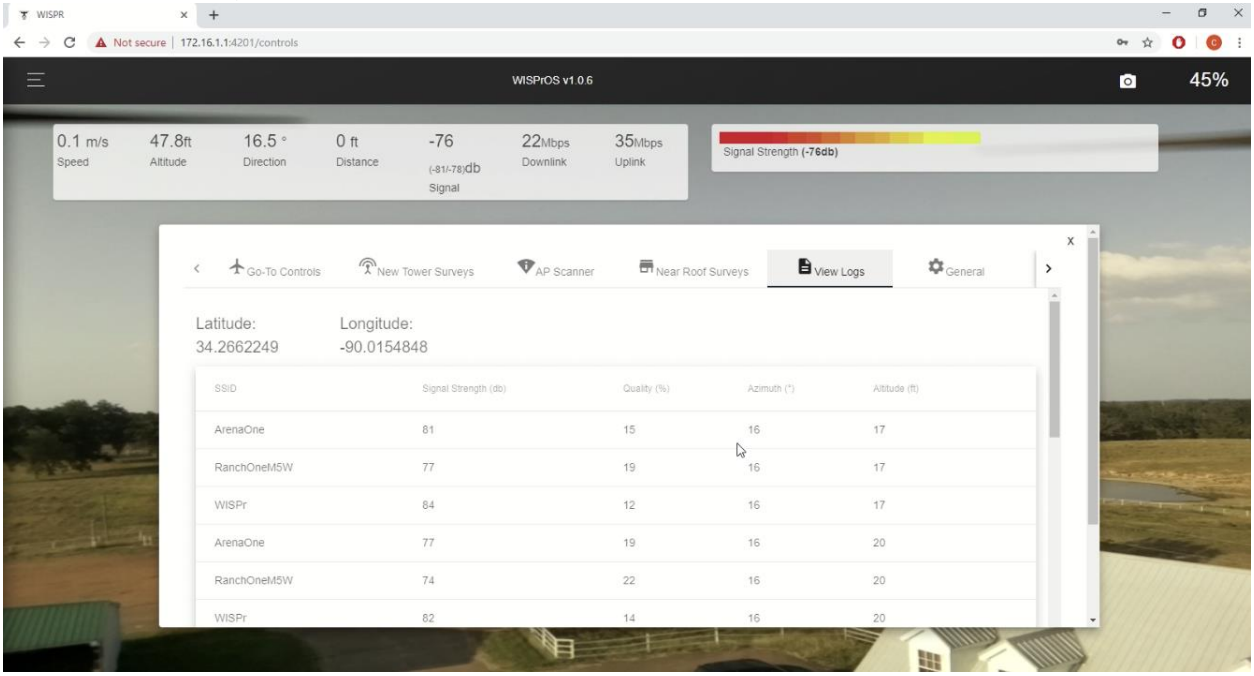
Near Roof – Single point (New Tower) log view in flight

The logs display all the signal points gathered and gives you the best height and the direction to install you CPE to install services and all signal points gathered from starting location and up to 30 feet above that location (depending on the user's selection).



Near Roof – Multipoint (AP Scanner) log view in flight

The logs for the Near Roof – multipoint (AP Scanner) will display all the access points available for possible connection points to provide services from start to 30 feet above that location (depending on the user's selection).



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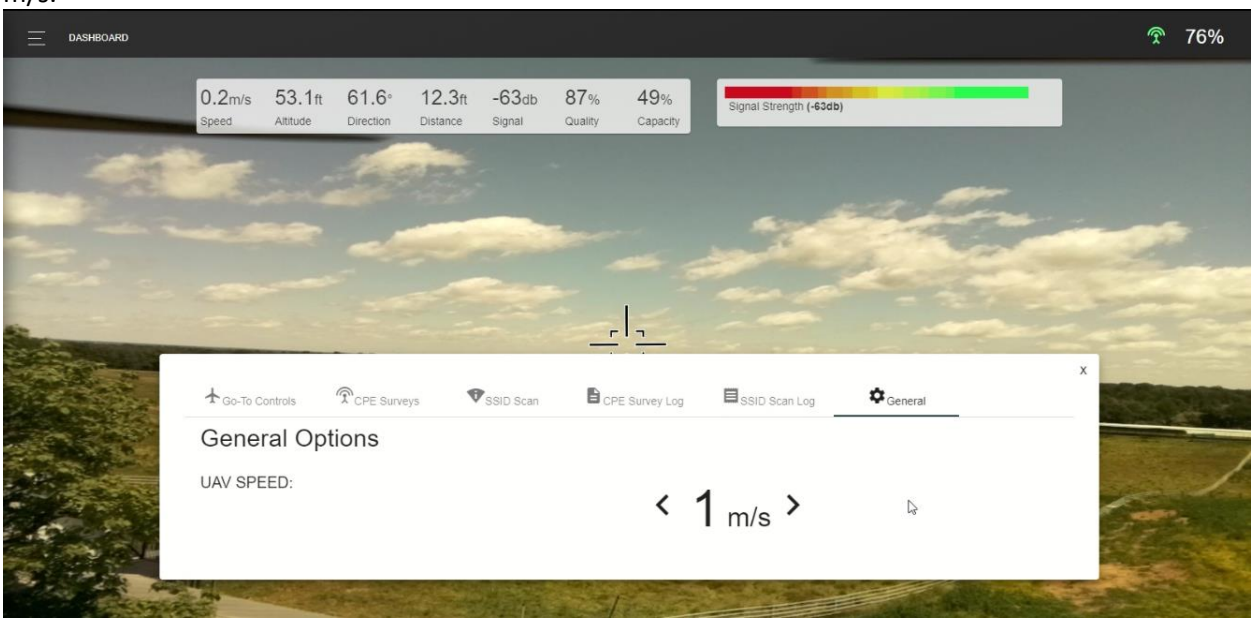
General

The general tab allows the user to change the speed of the Drone. The maximum speed allowed is 1.5 m/s.



UAV speed effects manual flights only. It does not affect the speed of autonomous functions.

If precise maneuverability is needed, select the lowest speed to operate.

If a large distance is needed to be reached, increase the speed to reach the location, and decrease the speed once it is reached to achieve more precise movement.

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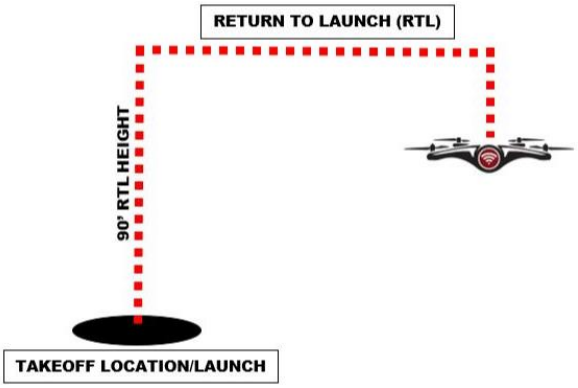
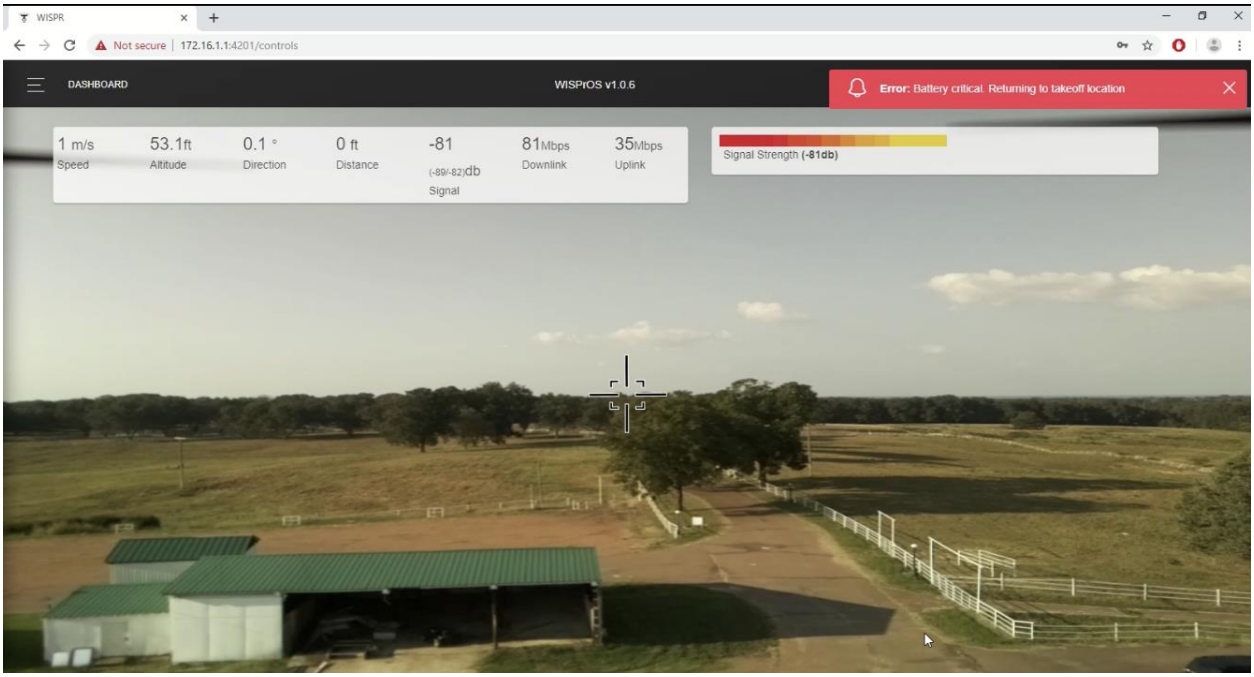
Failsafes

There are failsafes built into the WISPr OS to protect the drone and the user.

<u>Battery level low failsafe</u>

- Less than 120 feet horizontally and vertically the drone will Return to Launch (RTL) at 20% battery level
- Greater than 120 feet horizontally and vertically the drone will RTL at 20% battery level





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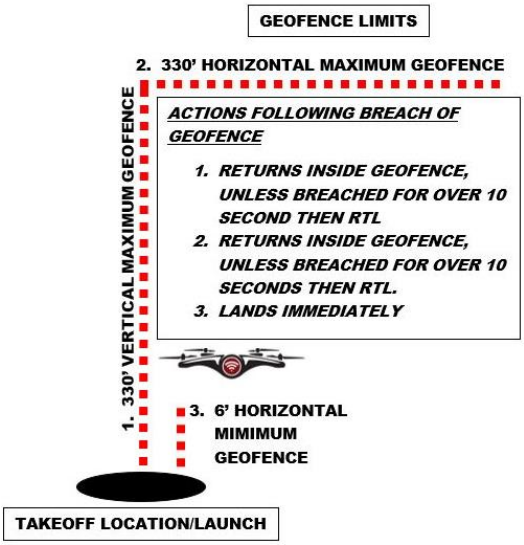
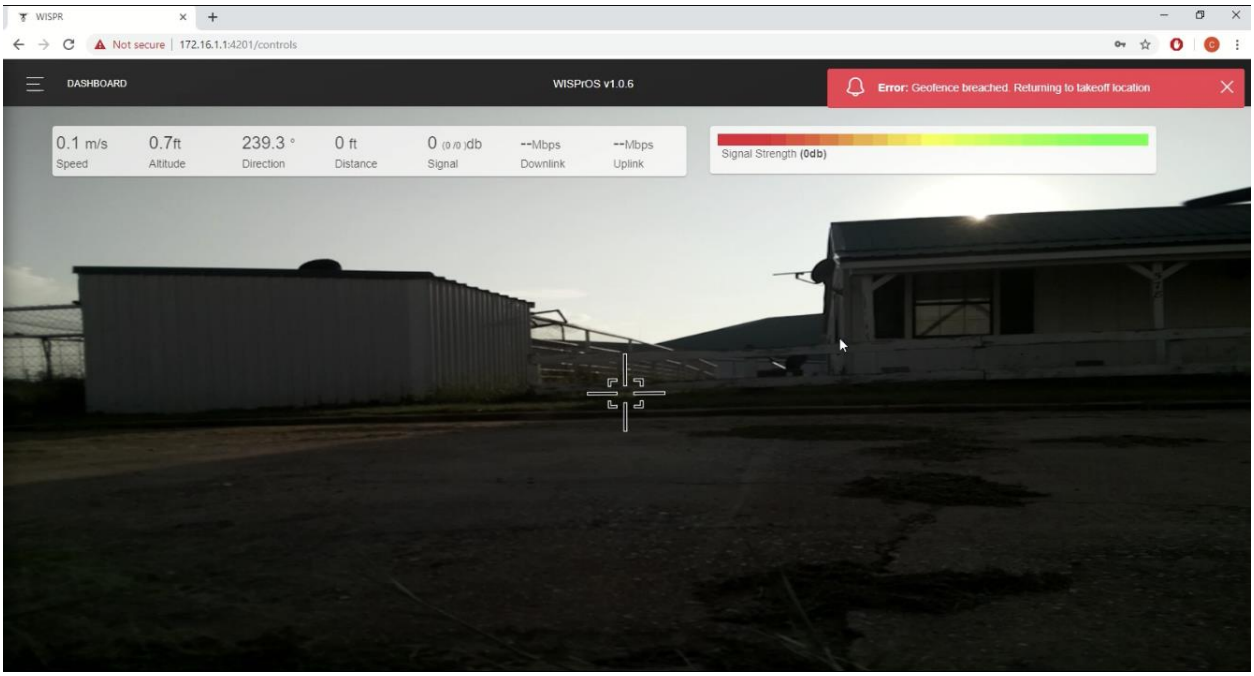
Geofence failsafe does the following if you fly outside the designated geofence

- Returns inside of geofence if the drone has exceeded a vertical and horizontal geofence of 330 feet
- RTL is engaged if the horizonal geofence is exceeded for over 10 seconds
- If the drone is flown under 6’ it will land automatically





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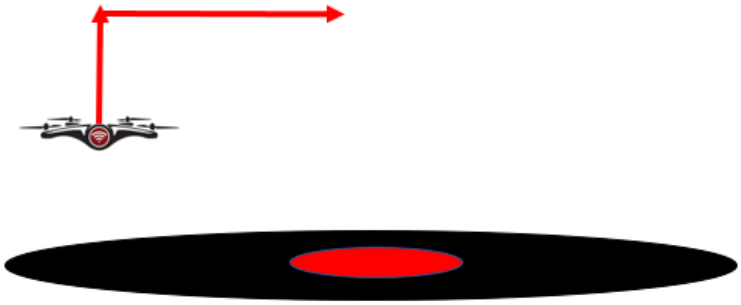
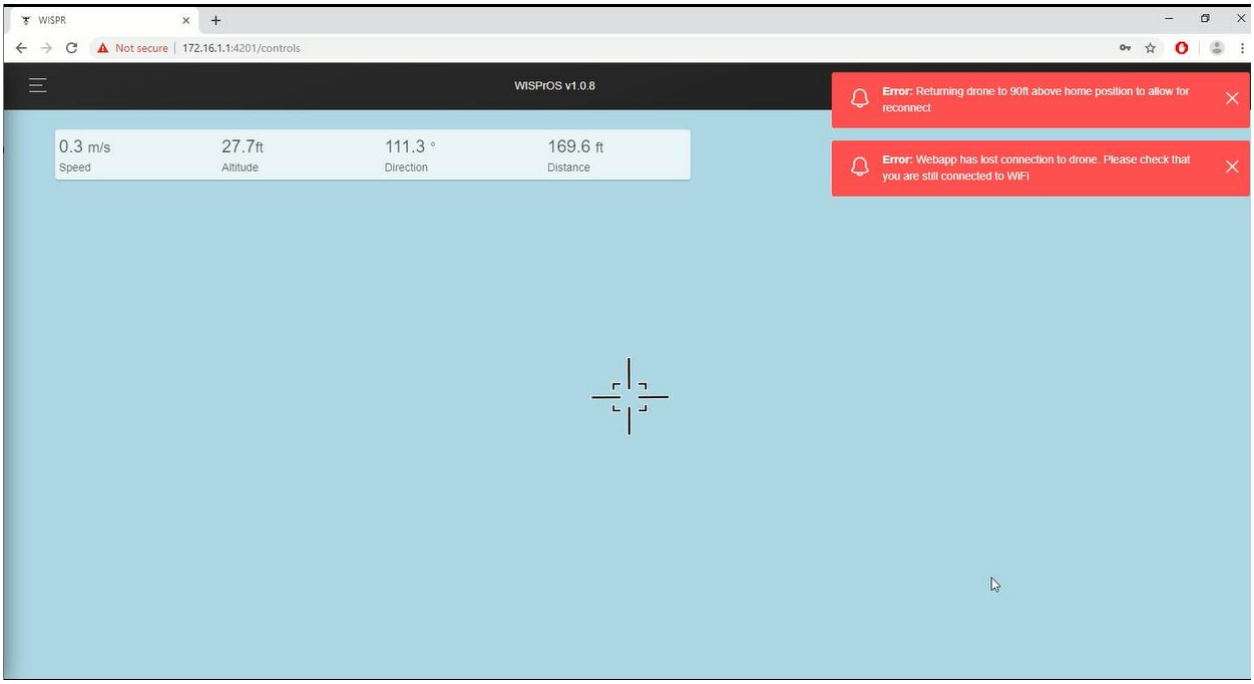
Disconnect from drone's access point or web app failsafe

- If you accidentally close the WISPr OS web app or lose connection to drones access point during flight the drone will return within a 20ft radius from the home position at an altitude of 90ft.
- Likely the drone will hover directly over home, but if not, it will be within 20 feet.
- This allows the user to reconnect and bring the drone closer to home incase this happens for precautions.





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WISPr CLOUD

Information about the WISPr CLOUD can be found in the WISPr CLOUD operator's manual.

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