

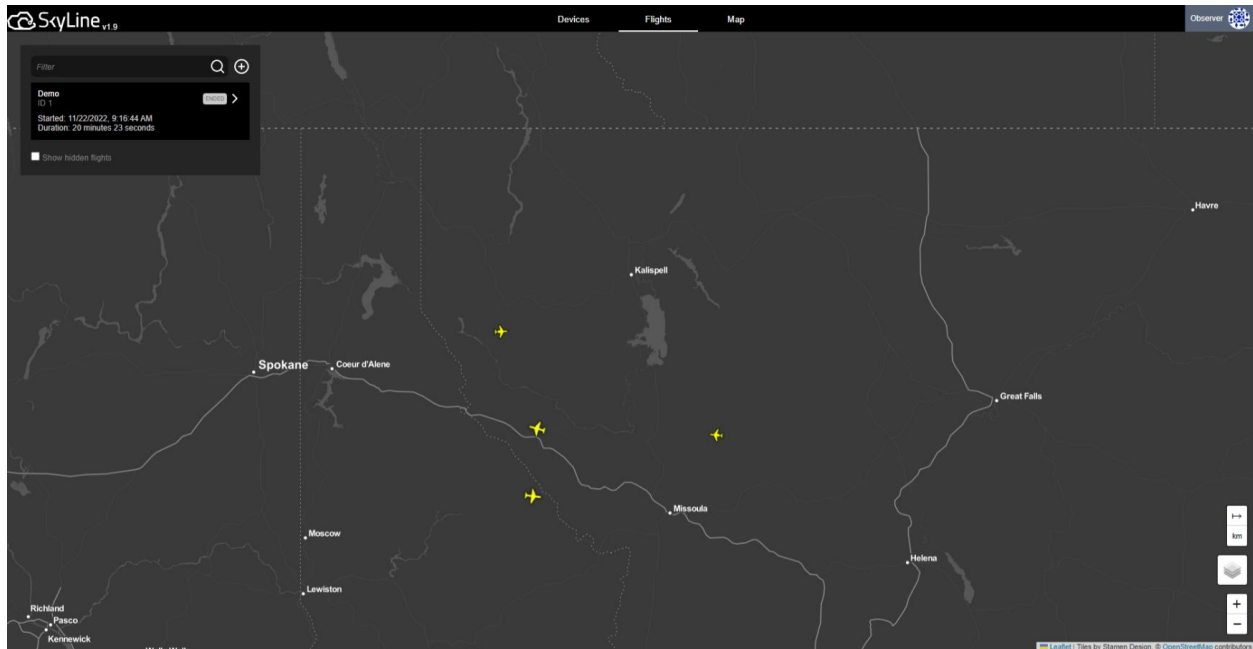


SkyLine

v1.9

User and Installation Manual

REVISION F



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uAvionix Corporation

300 Pine Needle Lane

Bigfork, MT 59911

<https://www.uavionix.com/>

<https://www.uavionix.com/support/>

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1 Revision History

Revision	Date	Comments
A	09/21/2021	Initial release
B	12/13/2021	Add mission replay, device management, access roles
C	5/20/2022	Update to reflect new SkyLine UI and user management
D	9/19/2022	Fix broken reference
E	10/21/2022	Update ADS-B Endpoint Configuration
F	11/22/2022	Update for 1.9

2 Warnings / Disclaimers

All device operational procedures must be understood prior to operation.

uAvionix is not liable for damages arising from the use or misuse of this product.

3 Limited Warranty

uAvionix products are warranted to be free from defects in material and workmanship for one year from purchase. For the duration of the warranty period, uAvionix, at its sole option, will repair or replace any product which fails under normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost.

This warranty does not apply to cosmetic damage, consumable parts, damage caused by accident, abuse, misuse, water, fire or flood, damage caused by unauthorized servicing, or product that has been modified or altered.

IN NO EVENT, SHALL UAVIONIX BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE OF, MISUSE OF, OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Warranty Service

Warranty repair service shall be provided directly by uAvionix.

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5 Introduction

SkyLine is an enterprise command and control infrastructure management service for critical UAS and UAM applications used to manage Control and Non-Payload Communications (CNPC) solutions. CNPC links provide Command and Control (C2) functionality of a UAS, and specifically exclude payload data that does not serve the CNPC function. SkyLine is what is known by RTCA DO-377A¹ as a C2 link Communications Service Provider (C2CSP) platform.

SkyLine is a cloud-based solution which communicates in real-time to all components of the CNPC link system (including all ARS and GRS) and provides real-time telemetry, health and status, radio performance statistics to a remote pilot in command (RPIC), flight crew, or other operations personnel. SkyLine has many additional features including data storage, detect and avoid (DAA) functionality, and frequency allocations.

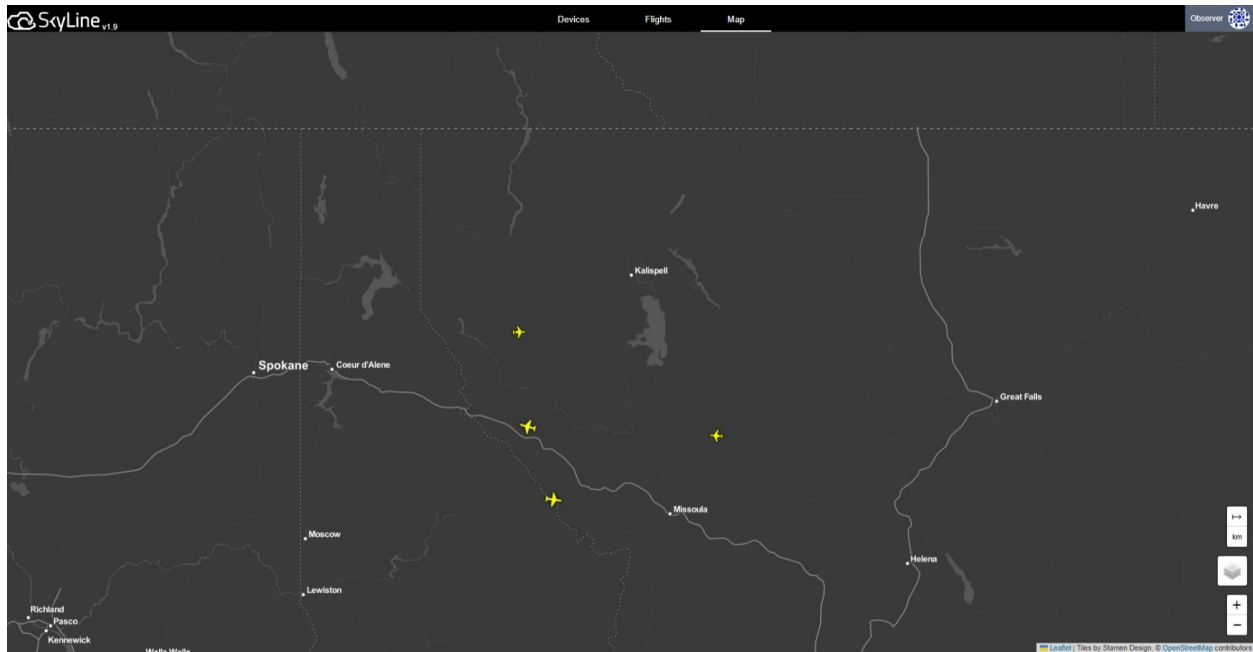
SkyLine is available as an application/service from uAvionix or as an API for integration into Uncrewed Traffic Management (UTM) or Ground Control Station (GCS) platforms.

When SkyLine is used with multiple GRS, SkyLine manages make-before-break (MBB) functionality to allow roaming of a single ARS from one GRS to another in a safety-case compliant manner.

SkyLine leverages uAvionix radios, autopilots, and software for seamless mission operation and monitoring. To accompany this installation manual, reference your uAvionix radio manual, *SkyLine GRS IM* (UAV-1006973-001) and *SkyLine ARS IM* (UAV-1006972-001).

¹ Safety-of-flight information is any information/data sent to or received from the UA that is necessary to ensure the UAS is operated/operating in a manner that protects people and/or property from harm due to unintentional events.

6 SkyLine User Interface (UI)



The SkyLine UI is where the user has access to manage their SkyLine network and perform flight operations. The SkyLine UI is accessible by opening a web browser and entering the SkyLine domain name assigned to you by uAvionix. Example below:

http://{YOUR_SKYLINE_TENANT}.skyline.uavionix.com/

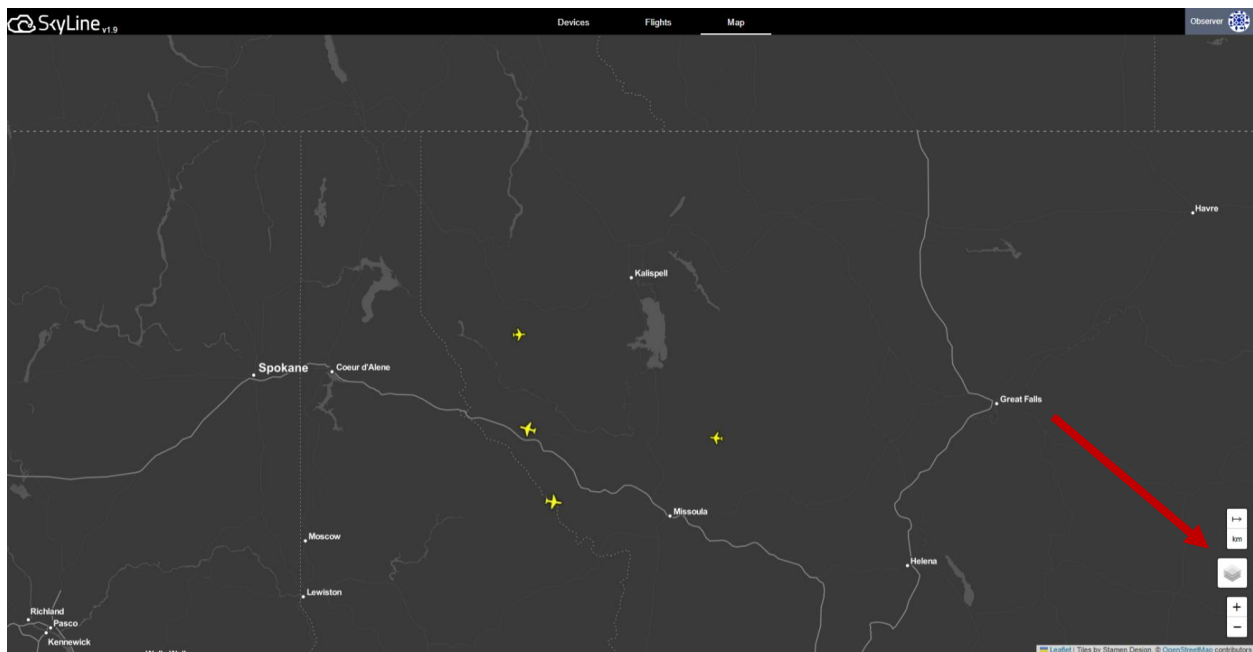
From the Main UI, the user can add devices, view existing device status, view previous flights, change user permissions, and change map type and overlays.

6.1 SkyLine UI Map

The SkyLine Map is available in the Flights Tab (see Section 6.2) and dedicated Maps Tab. From the map the user can view active and inactive ground devices, monitor ADS-B traffic, and view active flight statistics.

6.1.1 Map Layers

Map layers and filters can be changed by selecting the layers button in the bottom right corner of the map. Layers are in two categories Base and Overlay. Base layers are the background of the map. There can be only one base layer active. Overlay layers are drawn on top of the base layer. Overlays can be turned on and off by toggling the checkboxes.

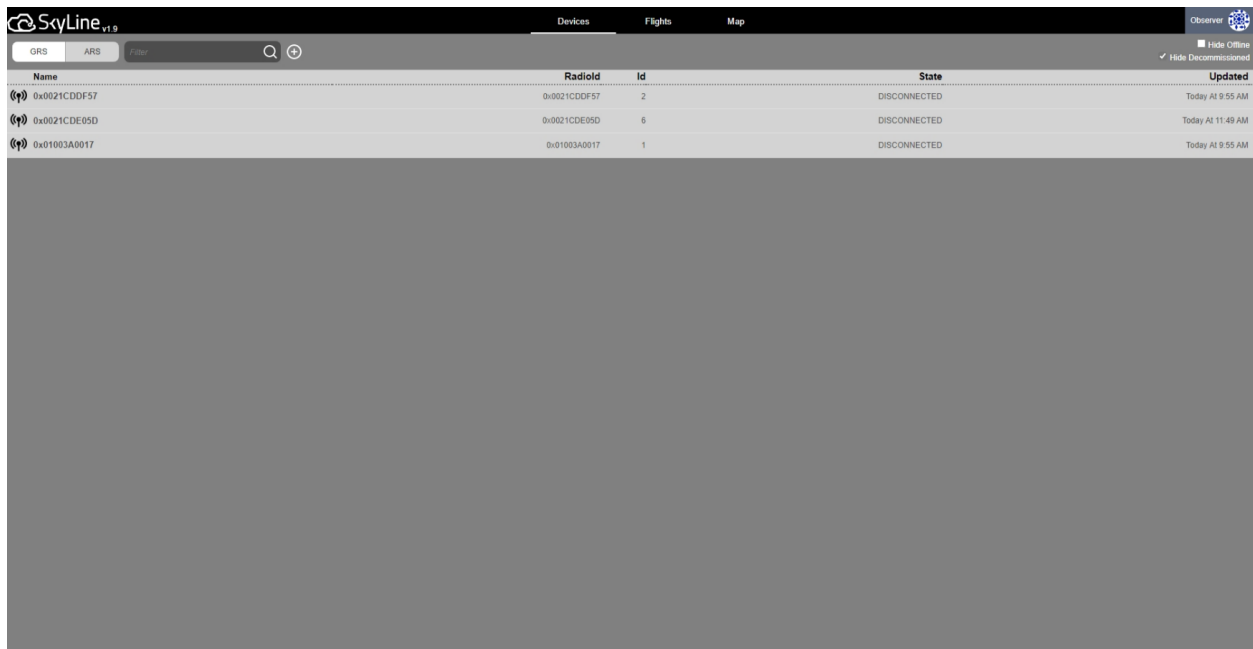





6.1.2 Measure Tool

The measure tool located just above the layers tool. This tool allows for drawing multiple points and measuring the distance between them. The ⇌ icon will turn the measure tool on. Pressing it again will remove the measurements and turn the tool off. The button below will change the units of measure. While on each click on the map will add a point to measure. Clicking on the last point again will stop the current line. Shift+Click on a point to remove it.

6.2 Devices Tab

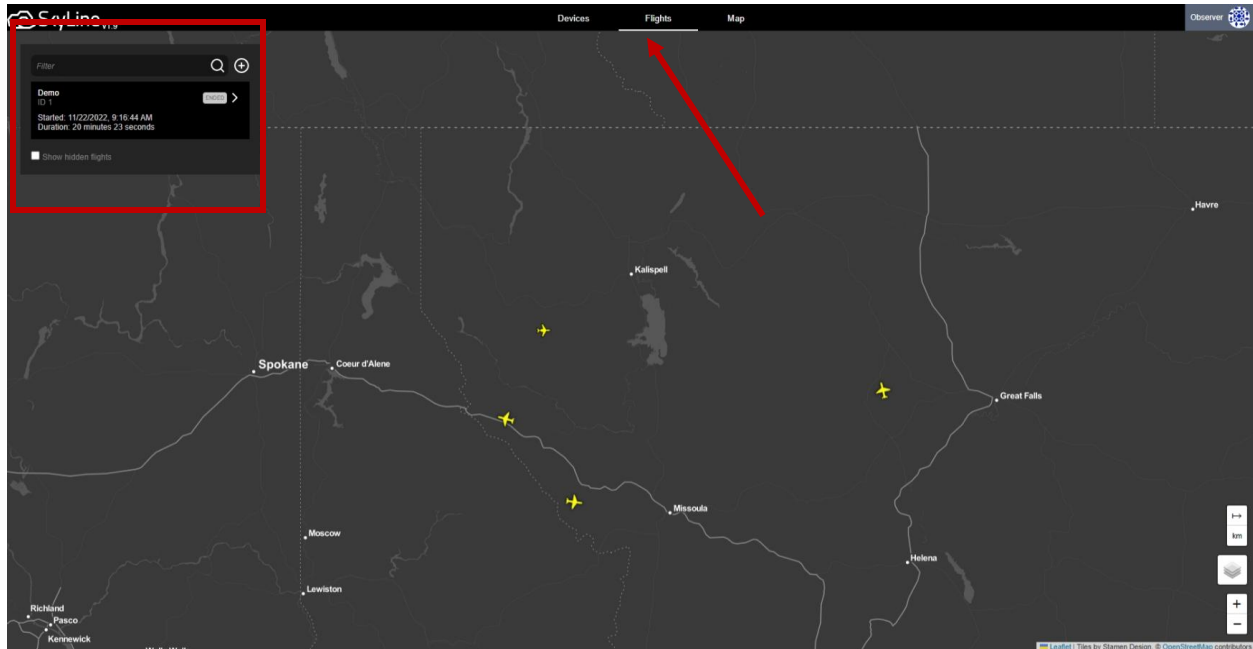
The Devices tab allows the user to view, add, remove, and edit devices by clicking on any device in the browser.



Name	Radioid	Id	State	Updated
 0x0021CDDF57	0x0021CDDF57	2	DISCONNECTED	Today At 9:55 AM
 0x0021CDE05D	0x0021CDE05D	6	DISCONNECTED	Today At 11:49 AM
 0x01003A0017	0x01003A0017	1	DISCONNECTED	Today At 9:55 AM

6.3 Flights Tab

The “Flights” tab opens the Flights browser which shows past flights and active flights. In the flights list, new flights can be created (see Section 8) and clicking on a flight will go to its live or replay view.



6.4 Admin Tab (Users)

The SkyLine UI can be set up for anonymous access or restricted access with users. Users can login through Microsoft or Google on a specific email domain.

6.4.1 Roles

- Observer – Allows the user to view and read information but not to alter anything
- Contributor – Allows the user to edit devices and flights, but not start or end flights.
- Flight Operator – Allows the user to start and end flights, but not create them.
- Admin – Allows all permissions including user editing

6.4.2 Email Alias

Email Aliases are for users that have alternate email addresses and want to login under those secondary addresses.

7 Device Registration

7.1 Ground Radio

Reference *SkyLine GRS IM* (UAV-1006973-001) Ground Radio System (GRS) installation procedures. When the Ground Radio System is installed and successfully connected to a network, the device will automatically be registered in SkyLine for use.

GRS settings are accessed via web browser from a PC or mobile device on the same Local Area Network (LAN) as the powered Ground Radio. The IP address of the Ground Radio is assigned by the DHCP server and is the base URL. The MAC address for the Ground Radio is printed on the product label.

1. Navigate to the settings page.

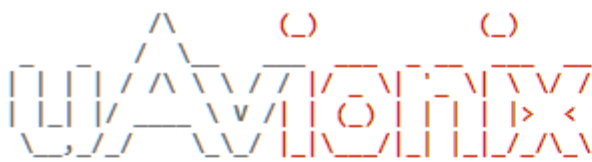
<http://###.###.###.###/>

NOTE: “###.###.###.###” is the IP address of the GRS.

2. Set the SkyLine WebSocket URL using your SkyLine installation URL. Replace {YOUR_SKYLINE_TENANT} with the SkyLine tenant provided by uAvionix. This url can also be found on the “New Device” section of the Devices tab.

ws://api.{YOUR_SKYLINE_TENANT}.skyline.uavionix.com/grs

3. Press the “Save” button.



Firmware Information

SkyStation Version: V 0. 0.12 [Update](#)

Radio Version: V1.0.12

RadioID: 0x21CDE05D

Settings

Skyline Information

Websocket URL:

Datamux Information

IP Address: (0.0.0.0 for listen)

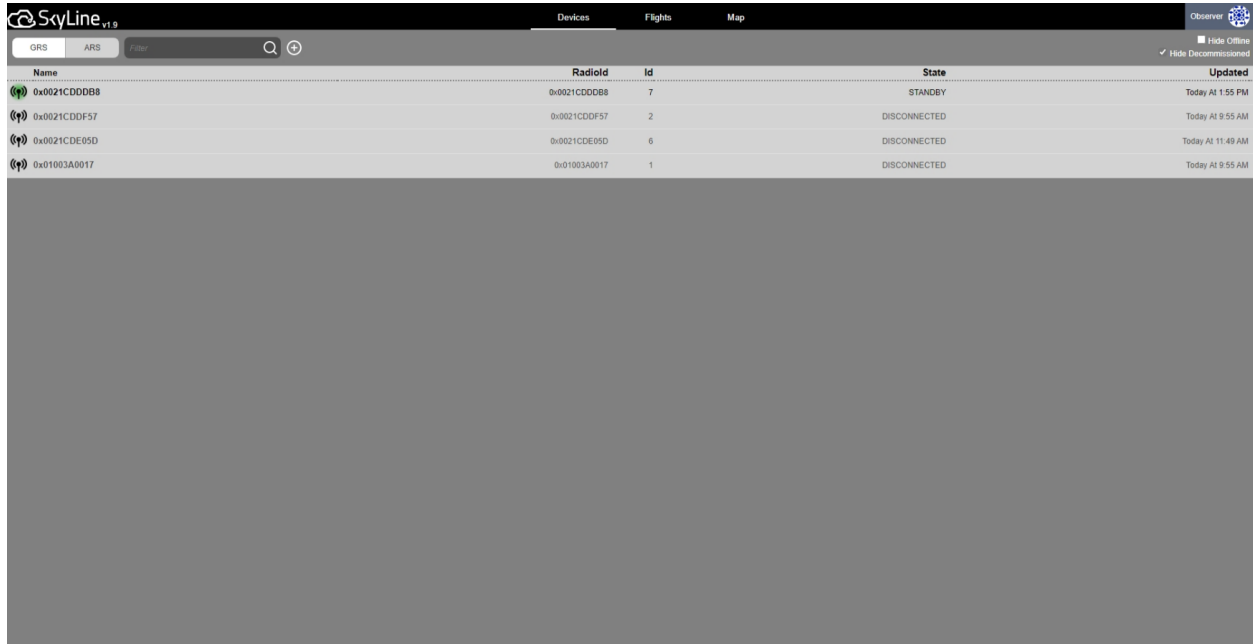
User Port:





Control Port:

[Network Configuration](#)

Save

- When the GRS is registered into SkyLine, you can view the device status on SkyLine under the Devices tab. Active devices have a green icon while inactive devices have no background.



Name	Radioid	Id	State	Updated
 0x0021CD00B8	0x0021CD00B8	7	STANDBY	Today At 1:55 PM
 0x0021CDDF57	0x0021CDDF57	2	DISCONNECTED	Today At 9:55 AM
 0x0021CDE05D	0x0021CDE05D	6	DISCONNECTED	Today At 11:49 AM
 0x01003A0017	0x01003A0017	1	DISCONNECTED	Today At 9:55 AM

5. Device connection can also be verified from the Map. All GRS that have been connected to SkyLine will be represented by a tower symbol. These symbols are located in the last known GPS position of the GRS. Active GRS will be indicated by having a green dot associated with the symbol.



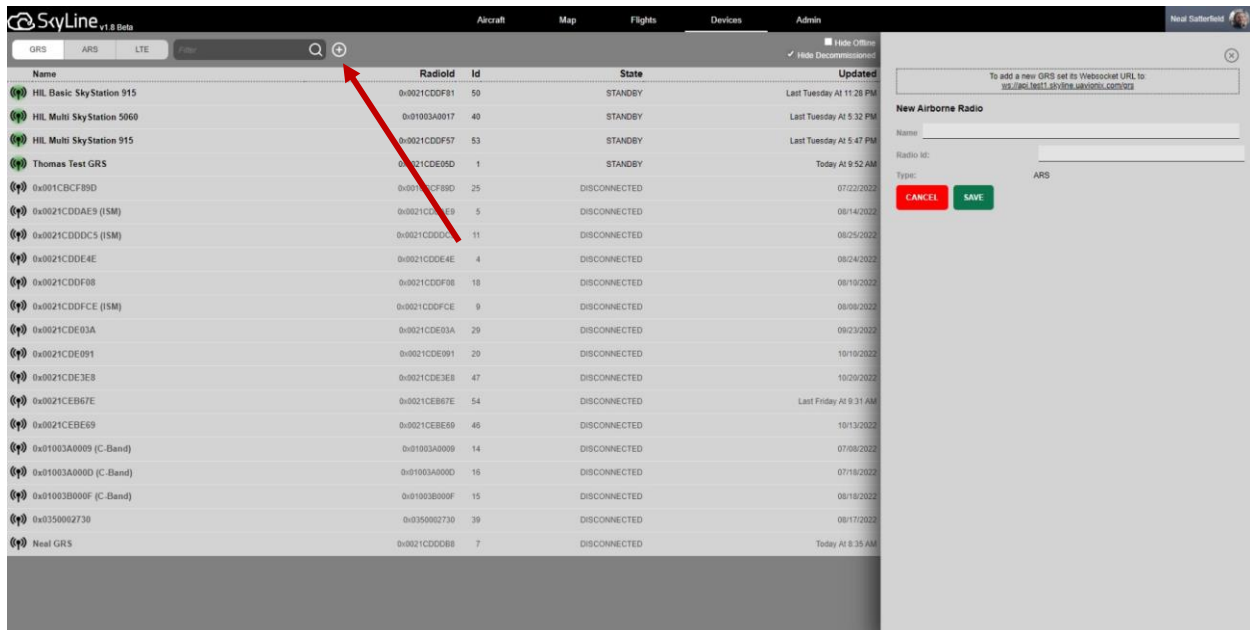
7.2 Air Radio

Reference *SkyLine ARS IM* (UAV-1006972-001) for Airborne Radio System (ARS) installation procedures. Ensure the ARS is in range of the ground radio and can acquire a GPS fix.

1. Launch SkyLine UI in a compatible web browser:

http://{YOUR_SKYLINE_TENANT}.skyline.uavionix.com/

2. Navigate to the “Devices” tab then press the “+” Icon.



3. Enter the Name, Radio ID, Frequency, and press “Save.”
 - a. The Name can be changed. It is for display only.
 - b. The Radio ID can be found on the ARS device label. It must match exactly when put into SkyLine. Radio ID’s must begin with “0x”
 - c. For SkyLink radios only, enter the ARS frequency. Reference the *SkyLine ARS IM* (UAV-1006972-001) to find the ARS frequency. The frequency box will only be available when using a SkyLink5060 ARS.

- d. For muLTElink devices it is recommended that you power the device, and it will automatically register to your system. If needed the system will allow you to manually enter the device, but you must first add the attached radios.
- 4. You can view successful registration by finding the new device in the devices list. ARS systems will be noted with a diamond symbol next to their name.

Note: An ARS will always show as DISCONNECTED unless it is an LTE device.

7.3 pingStation

With a uAvionix pingStation, live ADS-B air traffic can be displayed in SkyLine. Reference the *pingStation 3 User and Installation Guide* (UAV-1005950-001) for pingStation installation and setup. The IP address of the pingStation is assigned by the DHCP server and is the base URL. The MAC address for the pingStation is printed on the product label.

1. Navigate to the pingStation settings page.

<http://###.###.###.###/>

NOTE: “###.###.###.###” is the IP address of the pingStation.

2. Input the following settings in the settings page then click “Update.”
 - a. Output Format: UDP JSON
 - b. UDP Target IP Address or Hostname: air-traffic.services.uavionix.com
 - c. UDP Target Port: 7000



Configuration

UDP Output Format:

- ☒ UDP JSON
☐ UDP JSON (Status Only)
☐ UDP ASTERIX CAT021
☐ UDP Disabled

UDP Target IP Address or Hostname:

air-traffic.services.uavionix.com

UDP Target Port:

7000

TCP Output Format:

- ☐ TCP Compressed VR
☐ TCP ASTERIX CAT021
☒ TCP Disabled

TCP Push IP Address or Hostname:

TCP Port:

pingStation3 Network Address:

Preferred Static IP Address:

0.0.0.0

(0.0.0.0 for DHCP)

Subnet Mask:

0.0.0.0

Gateway IP Address:

0.0.0.0

DNS Address:

0.0.0.0

Advanced Recovery Options:

- ☒ Use DHCP Fallback For Static IP Recovery

Data Filters:

Altitude Ceiling In Feet:

0

(0 = No Filter)

Max Radius In Miles:

0

(0 = No Filter)

Station Info Interval In Seconds:

30

ASTERIX CAT021 Data Source ID Settings:

System Area Code:

00

System Identification Code:

00

[Update](#)

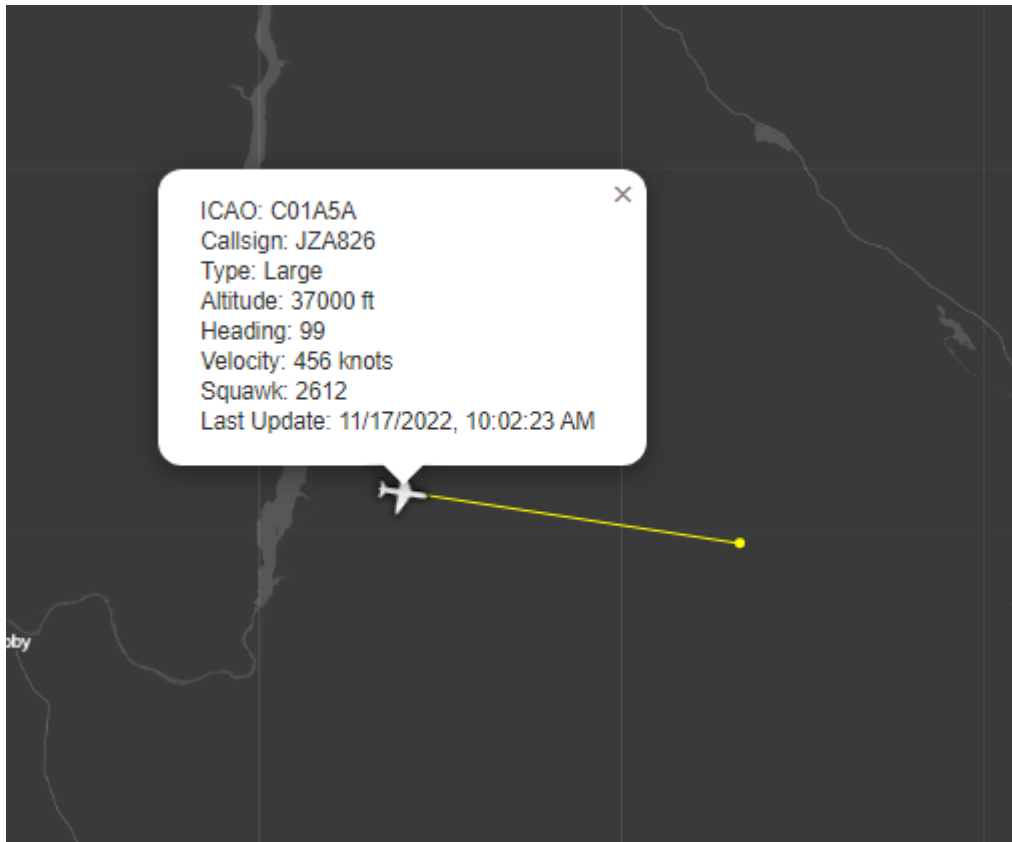
Health

UAT Basic: 18568
UAT Long: 34369
1090 DF17: 29409830
1090 DF18: 115371
Current Aircraft: 65
GPS Fix Type: 4
GPS Satellites: 12

Latitude: 42.010174 Longitude: -91.658134
Receiver BPS: 921600 GPS BPS: 115200
Version: 1.0.20
ADS-B Version: 2.4.50 [Update](#)

[About / Copyrights](#)

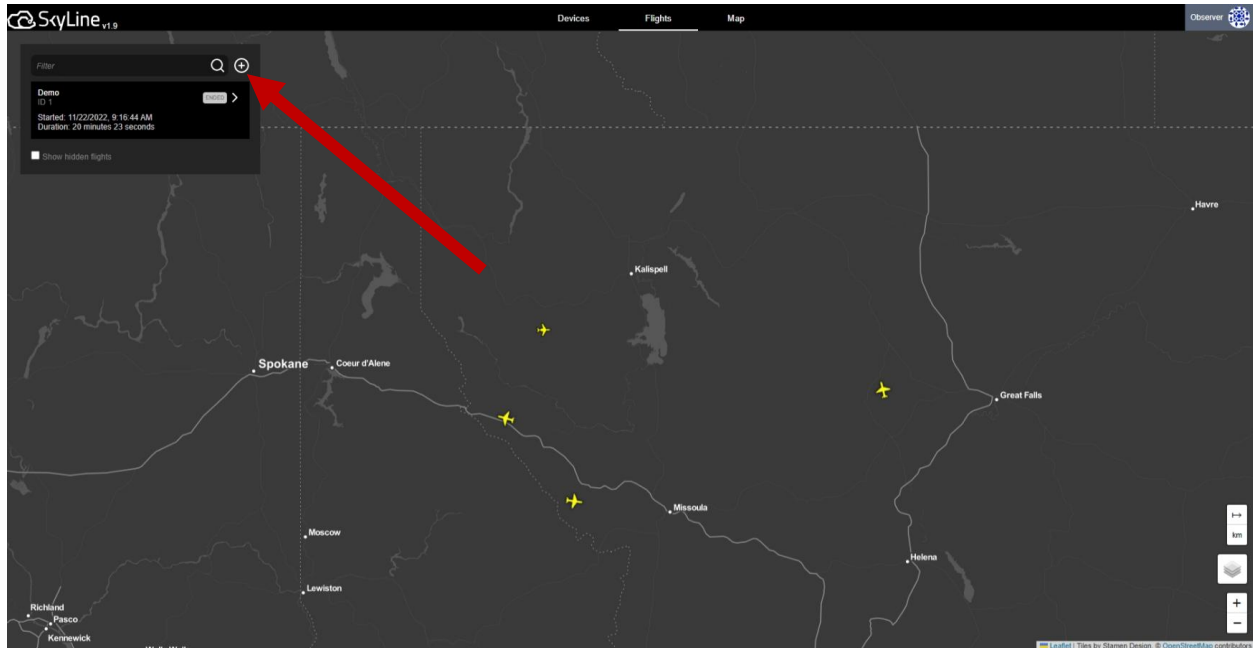
3. ADS-B Traffic will be displayed in SkyLine as an airplane symbol.
Click on the airplane symbol to display additional information on the selected traffic.



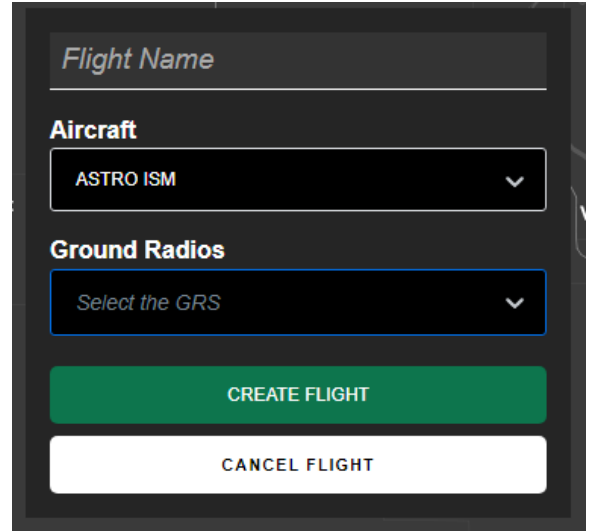
8 SkyLine Operation

8.1 Create Flight

1. Select the “Flights” tab then in the flight list click the plus symbol in the upper right corner.

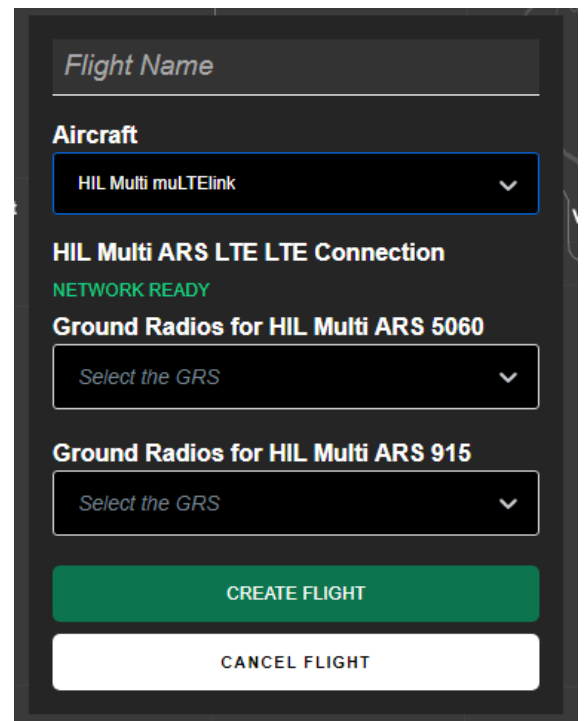


2. In the dialogue box enter a name for the flight. Then from the dropdown select the Aircraft that will be used for the flight. Finally, from the list of active Ground Radios, select all the GRS' that will be used for the flight.



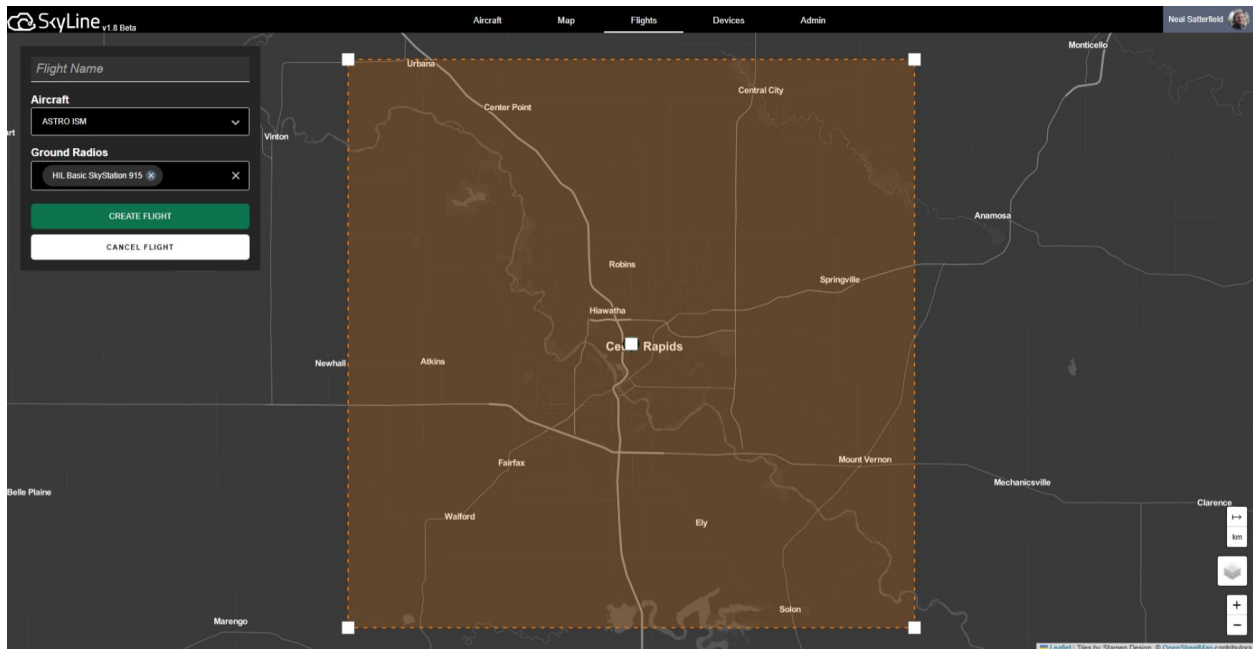
A screenshot of a flight creation dialog box. It features a text input field for 'Flight Name' at the top. Below it is a section titled 'Aircraft' with a dropdown menu currently showing 'ASTRO ISM'. Underneath is a section titled 'Ground Radios' with a dropdown menu showing 'Select the GRS'. At the bottom are two buttons: a green 'CREATE FLIGHT' button and a white 'CANCEL FLIGHT' button.

muLTElink will show the status of the LTE connection as well as providing a GRS selection dropdown for each ARS on the Aircraft



A screenshot of the muLTElink flight creation dialog box. It includes a 'Flight Name' input field. The 'Aircraft' dropdown shows 'HIL Multi muLTElink'. Below this, the status 'HIL Multi ARS LTE LTE Connection' is shown in green, followed by 'NETWORK READY'. There are two 'Ground Radios' sections: 'Ground Radios for HIL Multi ARS 5060' and 'Ground Radios for HIL Multi ARS 915', each with a 'Select the GRS' dropdown. The bottom buttons are 'CREATE FLIGHT' (green) and 'CANCEL FLIGHT' (white).

3. You will notice as GRS are selected, an orange operating area will populate on the map. The boundary can be modified to match the flight's actual operating area by clicking and dragging the corners of the boundary. This boundary only affects the supplemental recording of information (like ADS-B, Radar).



4. Click "Create Flight" when ready. The flight has now been created. When ready to begin the flight click "Start Flight" on the new dialogue box. Only the Flight Operator Access Role can start and end flights.
5. The flight status will change to "Active" when the flight is active.

Demo

ID 5

READY

Created: 11/23/2022, 9:12:49 AM


Flight Controls

C2 Links

GCS disconnected

Demo ARS

0x001CBCF16E

GRS: 

Demo

ID 5

ACTIVE

Created: 11/23/2022, 9:12:49 AM

Started: 11/23/2022, 10:17:40 AM

Flight Controls

GCS Connection Info

TCP Host: 3.210.202.188

TCP Port: 33687



WS Url: ws://3.210.202.188:36043


C2 Links

GCS disconnected

Demo ARS


0x001CBCF16E

details 

RSSI

-29.09

GRS: 

8.2 Flight Operation

Observer access role can view a flight while it is in progress.

When the flight is active, the GRS and the aircraft used for the flight will appear on the SkyLine UI Map when a link has been established. GRS will appear as the same tower symbol with a green dot. The Aircraft will appear on the map as a blue diamond.



When a GRS receives messages from the aircraft, a binding line between the two devices will appear. These lines will be either green, yellow, or red in color based on the signal strength. A blue binding line indicates that the aircraft is linked to that GRS. When the device roams, the blue line will switch to the next linked GRS.

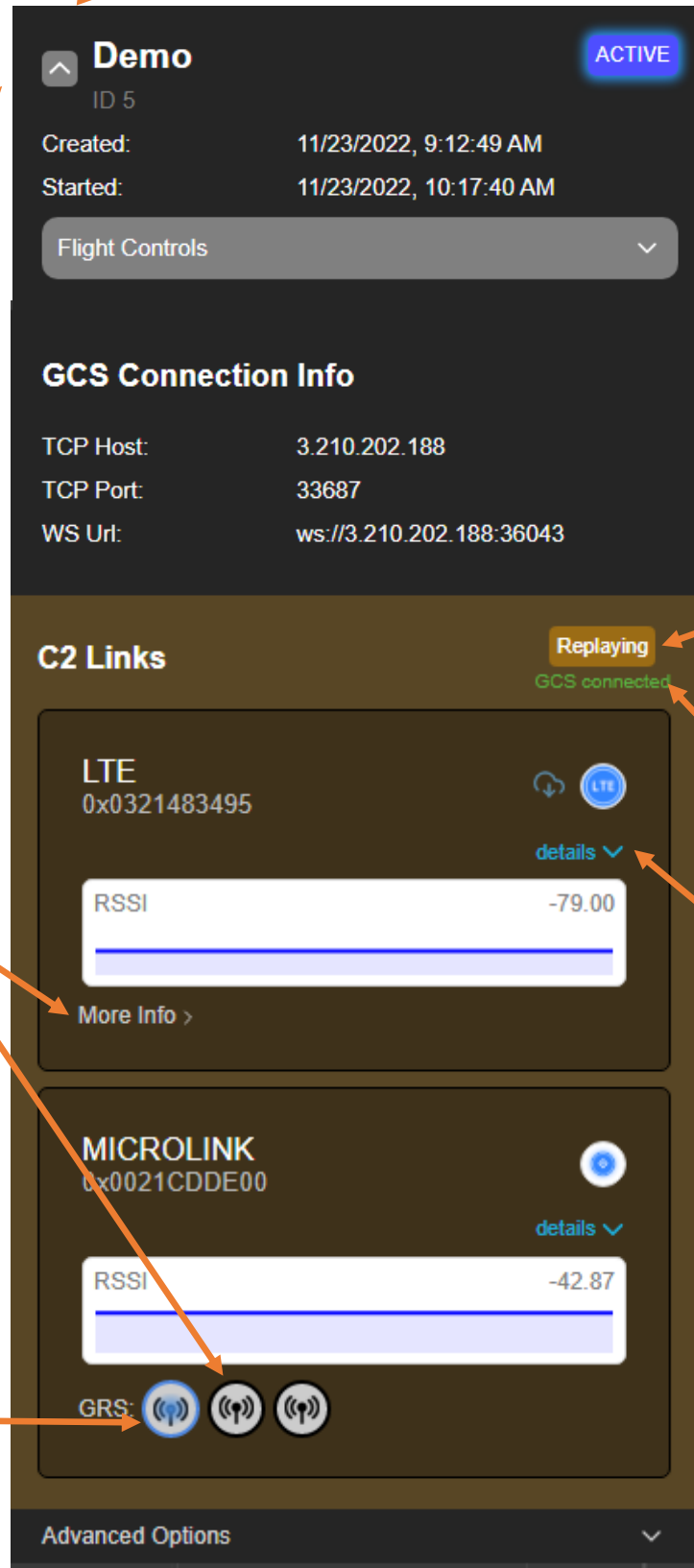
Flight Name and ID

Expand/Collapse Flight Card

Everything in the brown area shows a historical view of the data. All gray areas are live data.

Clicking these will show detailed information about the device

Blue indicates Lead GRS



Current Flight State. Possible Values:

- CREATED
- INITIALIZING
- ACTIVE
- ENDED

Will show Replaying when not viewing live data

Shows GCS connection status

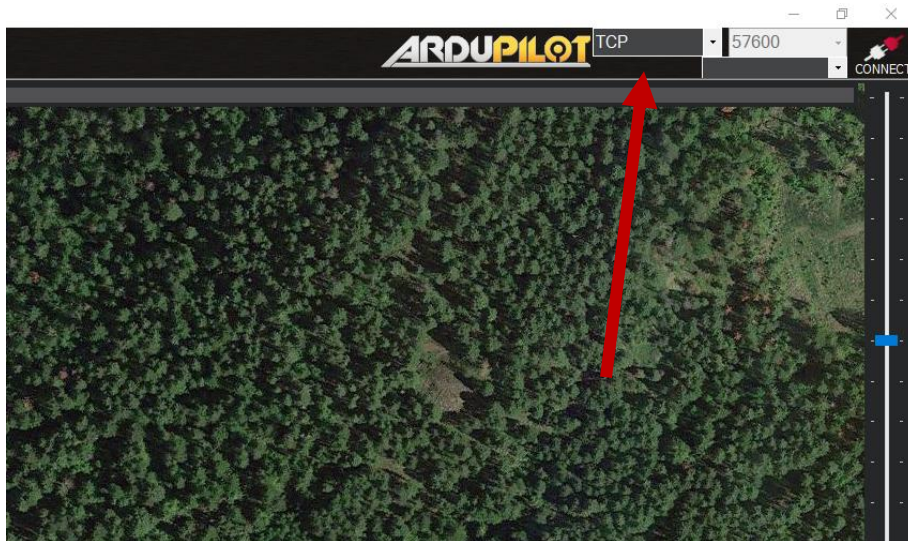
Show/hide ARS stats

8.3 Connect Ground Control Station

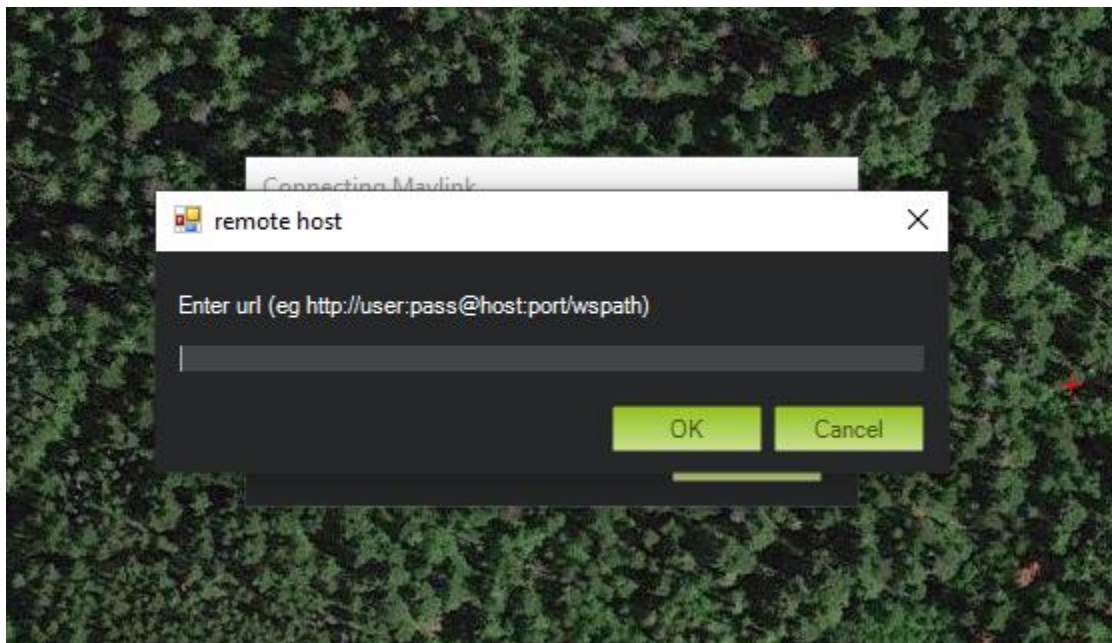
When a flight is active, a Ground Control Station (GCS) WebSocket (WS), TCP Host, and TCP port will be active through SkyLine. Use this information to connect to your GCS. An example using Mission Planner is shown below.

GCS Connection Info	
TCP Host:	3.210.202.188
TCP Port:	33687
WS Url:	ws://3.210.202.188:36043

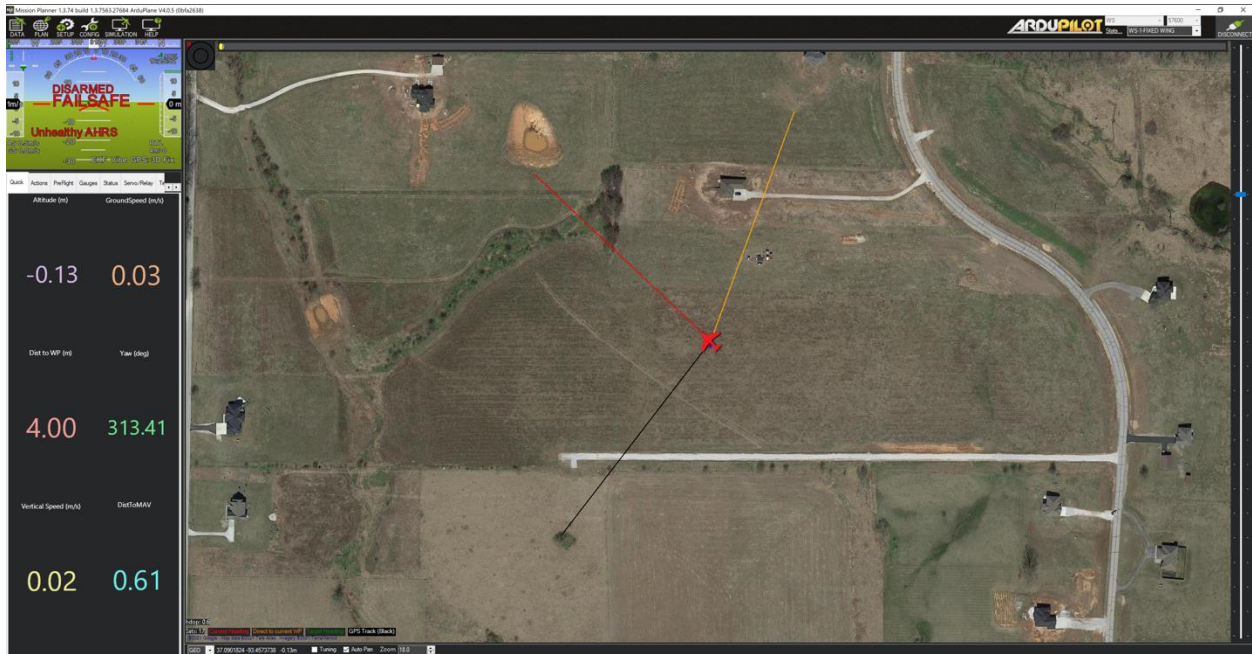
1. Open ArduPilot Mission Planner and in the communication drop down menu in the upper right corner, select TCP or WS, then press “Connect.”



2. From the SkyLine mission, copy the “GCS TCP Host” or “GCS WS URL” depending on your communication type.
 - a. TCP: enter the host and press OK, then enter the port and press OK.
 - b. WS: enter the entire “GCS WS URL” and press OK.

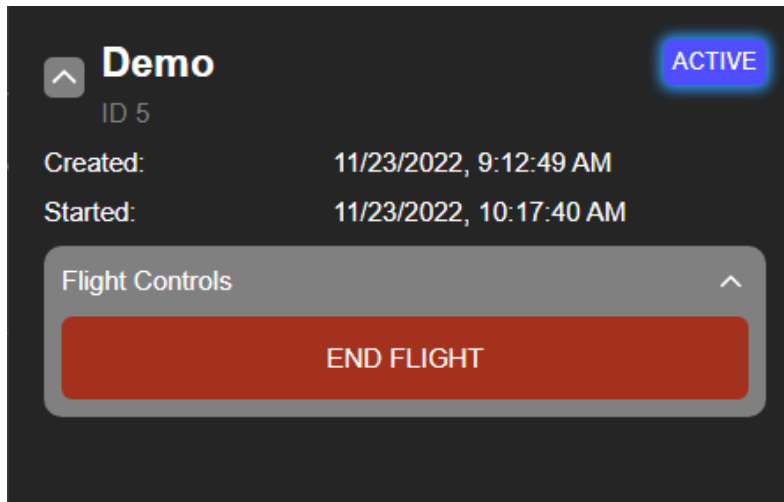


3. Mission Planner will now connect and display aircraft telemetry data.



8.4 End Flight

Once the flight operations have completed, you can end the flight by pressing “End Flight” in flight window. This will release the ground and aircraft radios from the mission and return them to a Standby state.



9 Support

For support visit <https://uavionix.com/support/>