Balloon Finder Manual

Version 2025.05

Last Updated:
7 May 2025

Contents

Credits

Automatic Position and Reporting System (APRS) is a registered trademark of Bob Bruninga, WB4APR.

Introduction

Balloon Finder began in 2000 as a mechanism to visually display flight data to school kids that the Project: Traveler group was working with at the time. Eventually this evolved into a full-blown mapping, tracking, and prediction package that has been used in one form or another on all of our flights starting in about 2001.

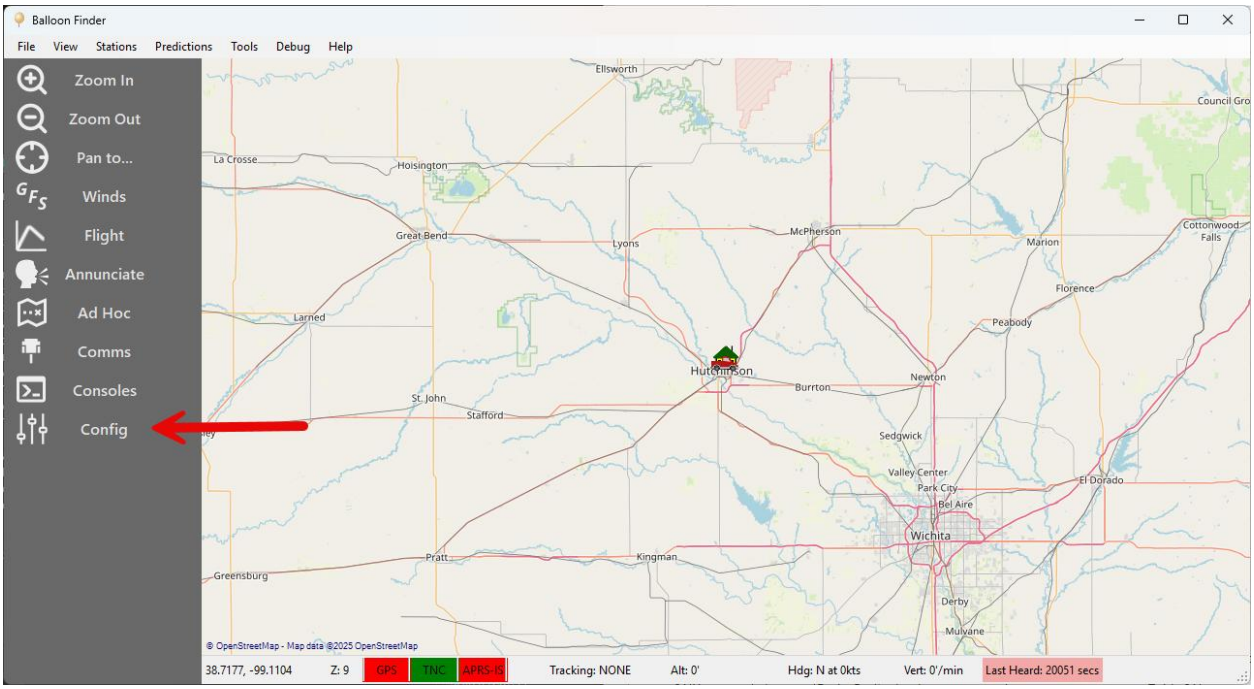
Originally written in Visual Basic 6, it was ported over to the Microsoft .Net platform around 2007, which initially took the application a few steps backwards as new and better controls and user-interfaces were developed. At that same time, some much-needed features were added such as real-time flight prediction were added, as well as the ability to run ad-hoc predictions based on other airborne balloons. Finally, around 2009, a fully integrated mapping solution was incorporated based on the open-source Open Street Map (www.openstreetmap.org).

While the software is fully functional and reasonably stable, it is currently in an "alpha" state. Currently the focus is to finalize a few features, and then the focus will turn towards polishing the user experience, and plugging a few stability holes.

Configuration

Initial Configuration

After installing Balloon Finder on your PC for the first time, it is necessary to configure some basic settings. Click the Config button in the left-hand pane.

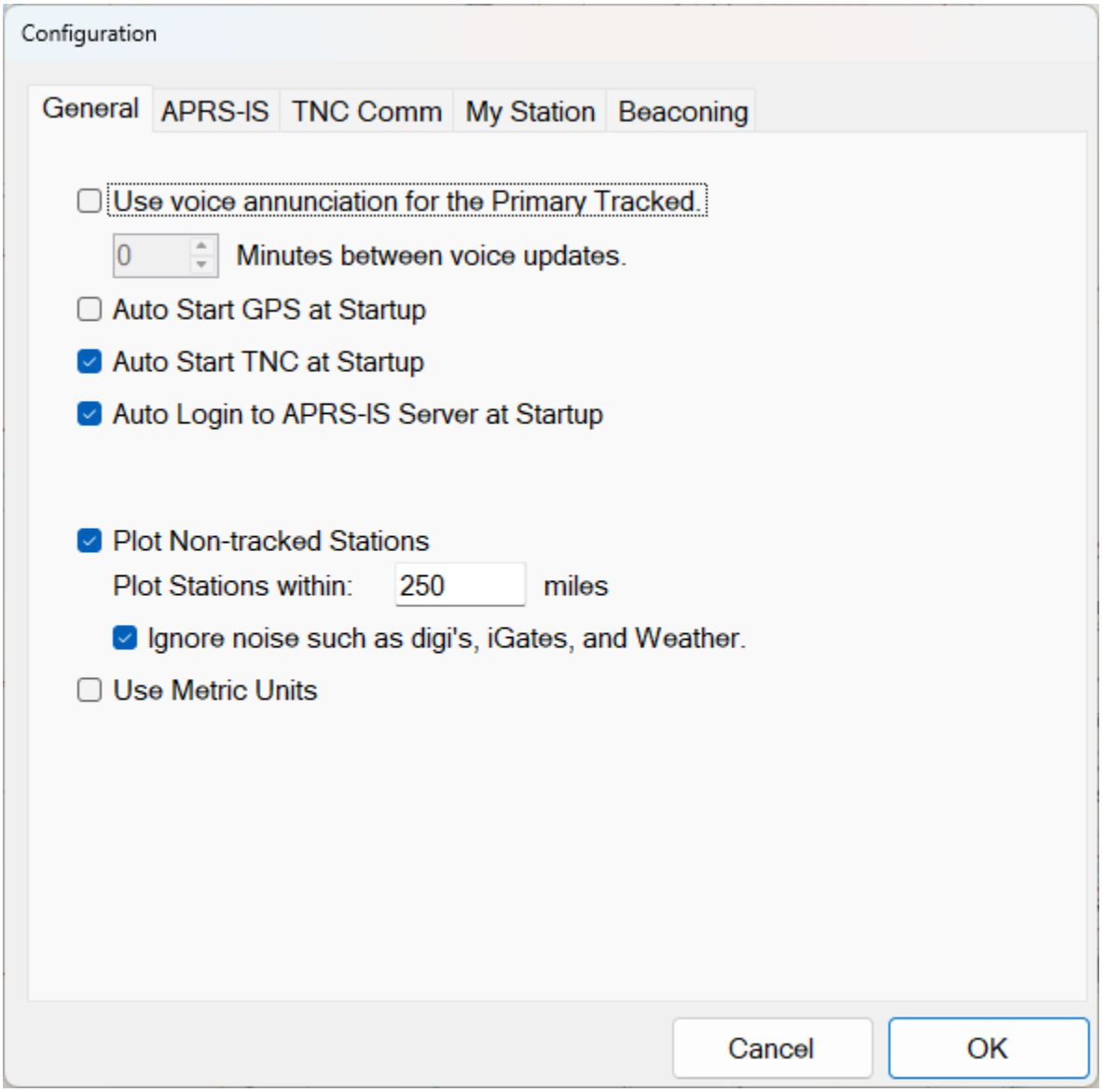


General Settings

Checking the boxes to auto start the GPS and TNC will cause the program to attempt connect to the Comm ports that have been configured for these devices. This can be useful to quickly connect, but if you expect that the Comm ports may not always be available such as when using a laptop, these options may cause issues for you.

Auto Login to APRS-IS at Startup is the same concept, only for the telnet connection to the APRS Internet backbone.

Plot Non-tracked Stations is an option that is normally left checked. If unchecked, then only stations you are explicitly tracking (i.e. your balloon) will show up on the map.



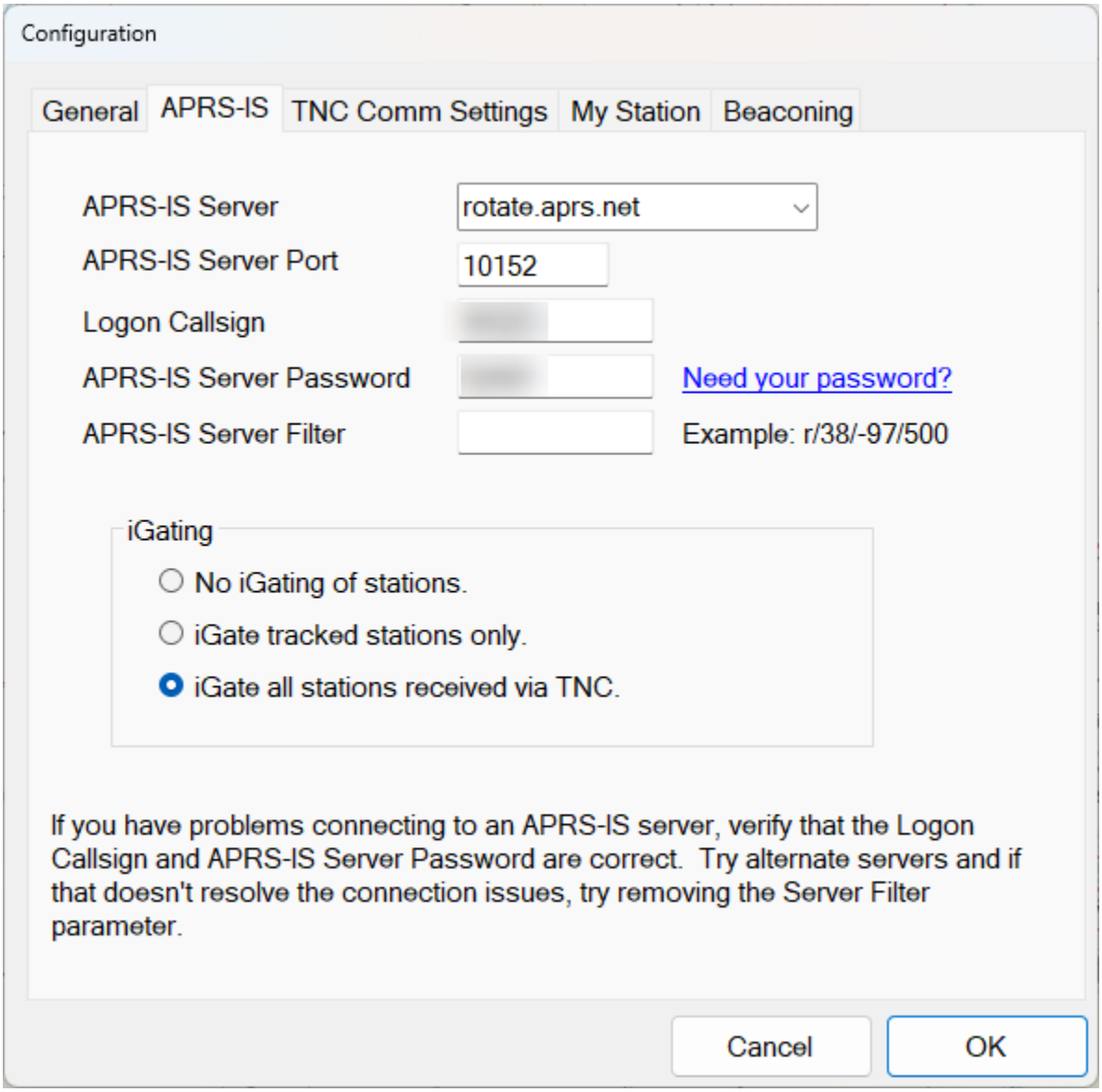
APRS-IS

If you wish to connect to an APRS Internet Server to receive APRS data feeds, select or enter the server name in the Server field. The Server Port is filled in next.

The APRS Login Callsign and the corresponding APRS Server password can be entered in. The APRS-IS Server Password is a five-digit numeric password that is based on your amateur radio callsign. If you need this password, click the “Need your password?” link at the right.

If you wish to filter your server feed (highly recommended), enter those filter values in the Filter field.

The checkbox to iGate Tracked Stations will cause the PC to send any tracked stations (those that are explicitly being tracked through the Stations-Tracking screen) to be iGated to the Internet.



TNC Comm

The TNC (or Terminal Node Controller) is the term for a radio modem which is used to convert the data signals coming in from the APRS beacon into digital signals that the computer can read.

Balloon Finder has been tested extensively with the following TNCs, although almost any KISS (Keep It Simple Stupid)-compatible TNC should work fine.

- KPC-3
- KPC-3 in KISS mode
- TNC-X (over both USB and Bluetooth)

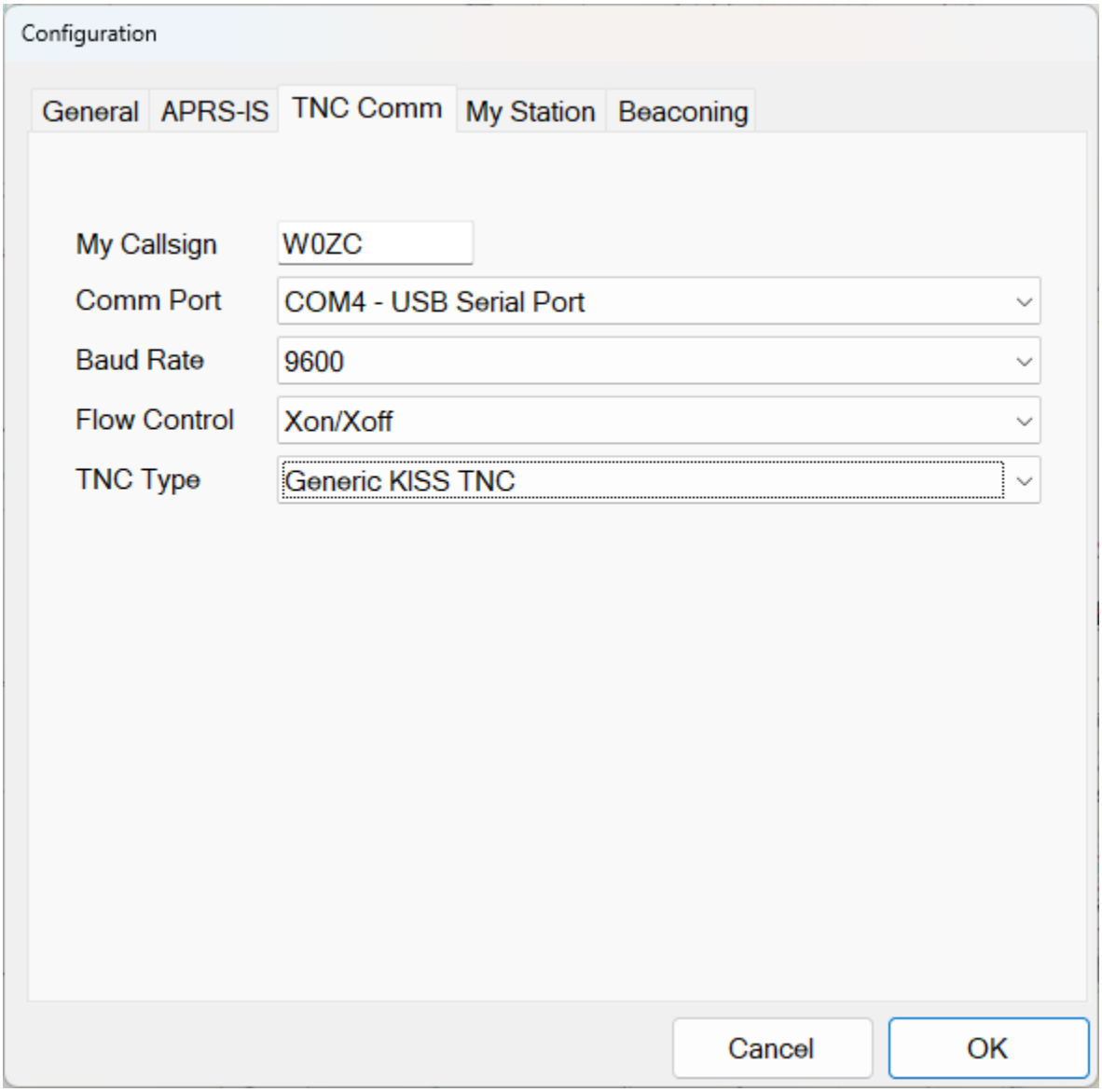
To configure the TNC for operation with Balloon Finder, all of the fields in the TNC Comm window need to be filled out.

The Callsign field indicates the callsign that may get transmitted via the TNC. This is otherwise known as "MYCALL" in TNC lingo.

The Comm Port will list all ports from Com1 to Com50. If the Com Port has been configured within Windows, the extended description of that port will appear alongside the port number.

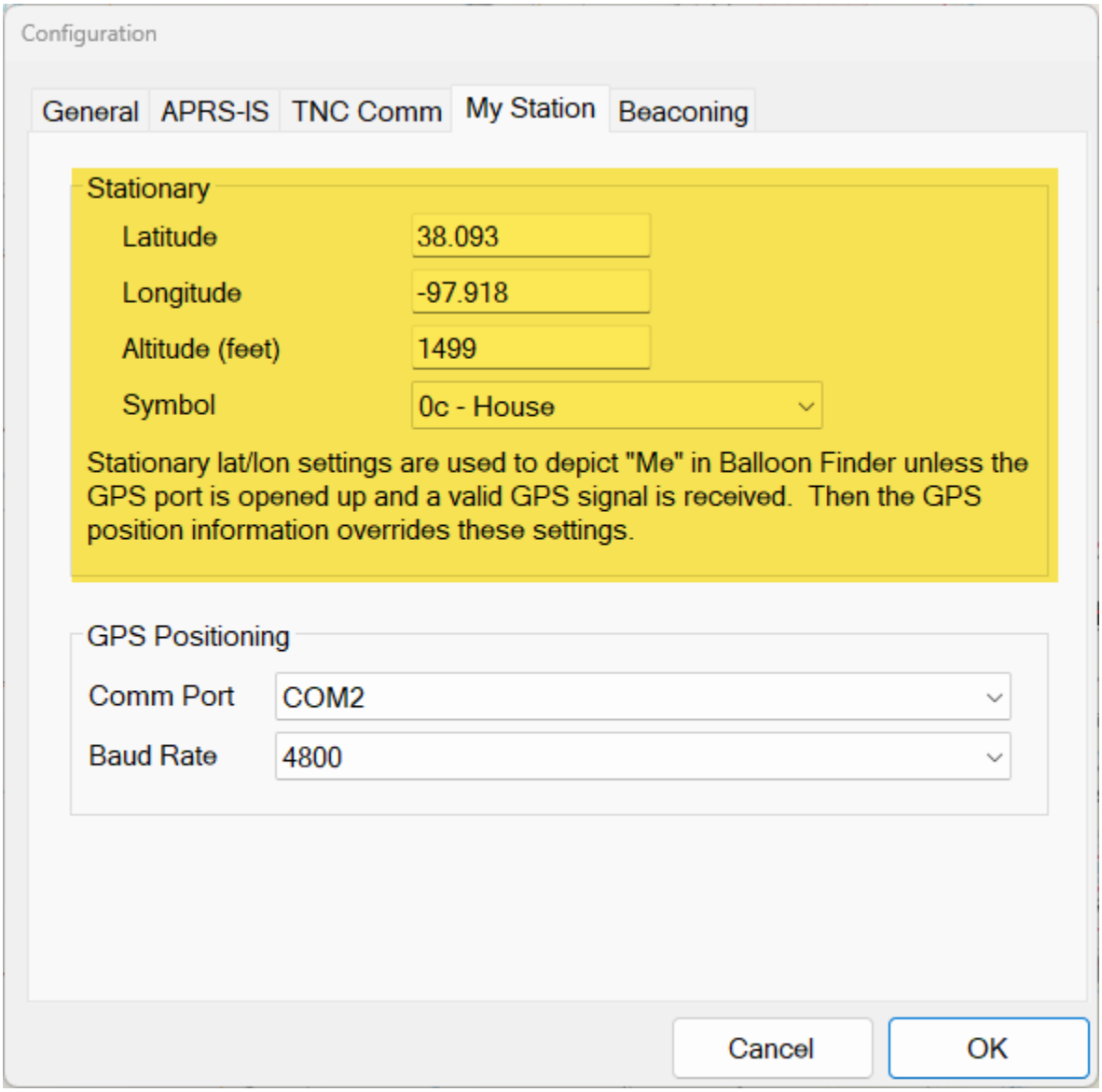
The Baud Rate and Flow Control settings define the rate between the computer and the TNC, and is *not* related to the baud rate that the APRS modem is operating at (typically 1200 baud). These are generally configurable on the device, and you would need to consult the manufacturer's specifications.

The last field selects which type of TNC is being attached to the Com Port. This tells Balloon Finder how to communicate and configure certain functions.



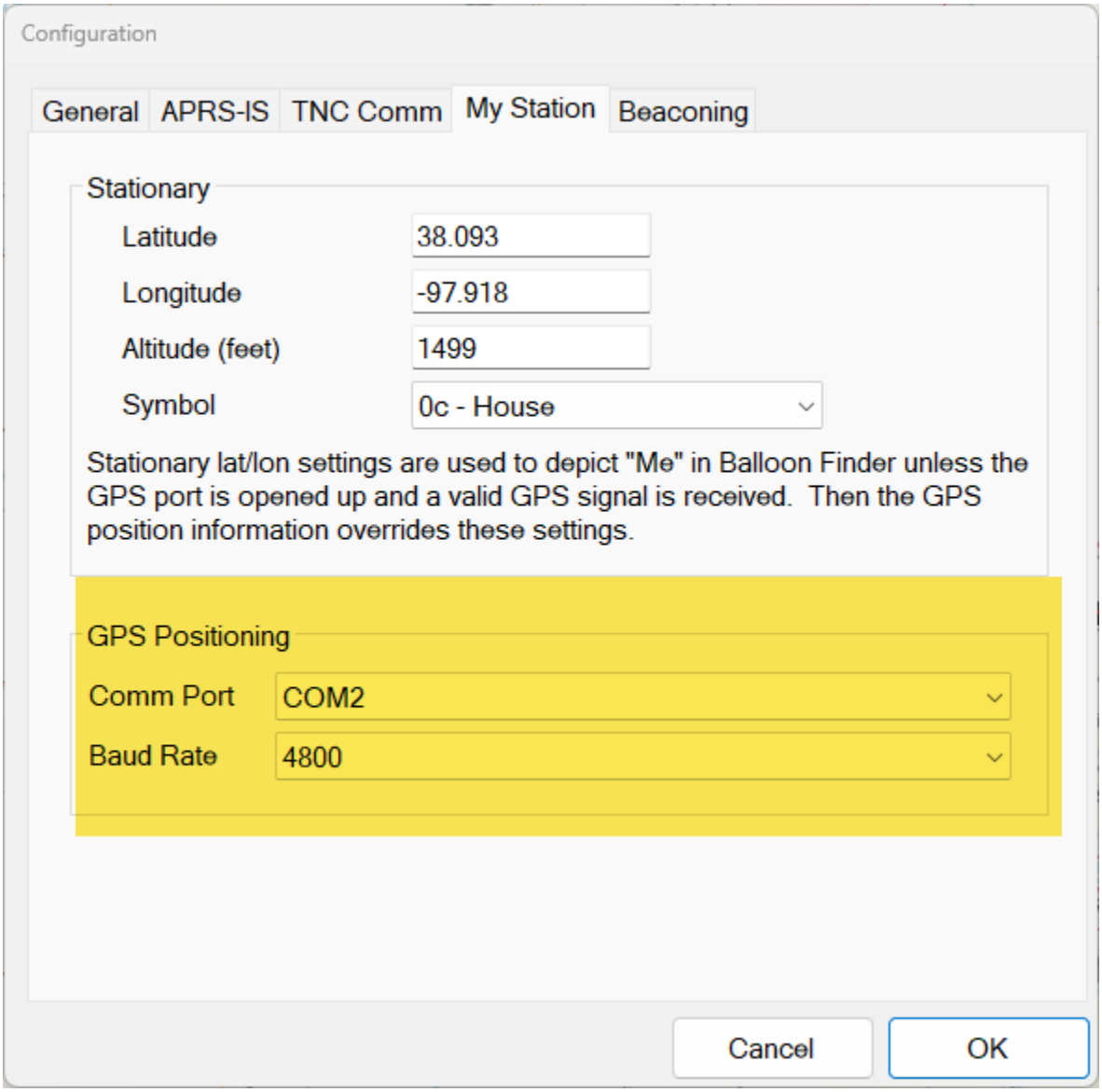
My Station

Balloon Finder has two options for setting the positioning of the home/tracking station. The most basic option is to configure the Latitude, Longitude, and Altitude of the tracking station. This is perfect for stationary tracking stations such as a home PC. You can select your Symbol from the list, and no additional configuration is necessary.



Alternatively, if you are operating Balloon Finder in a vehicle and would like to see the relative position of the chase vehicle compared to the balloon, then attaching a GPS to the computer is an option.

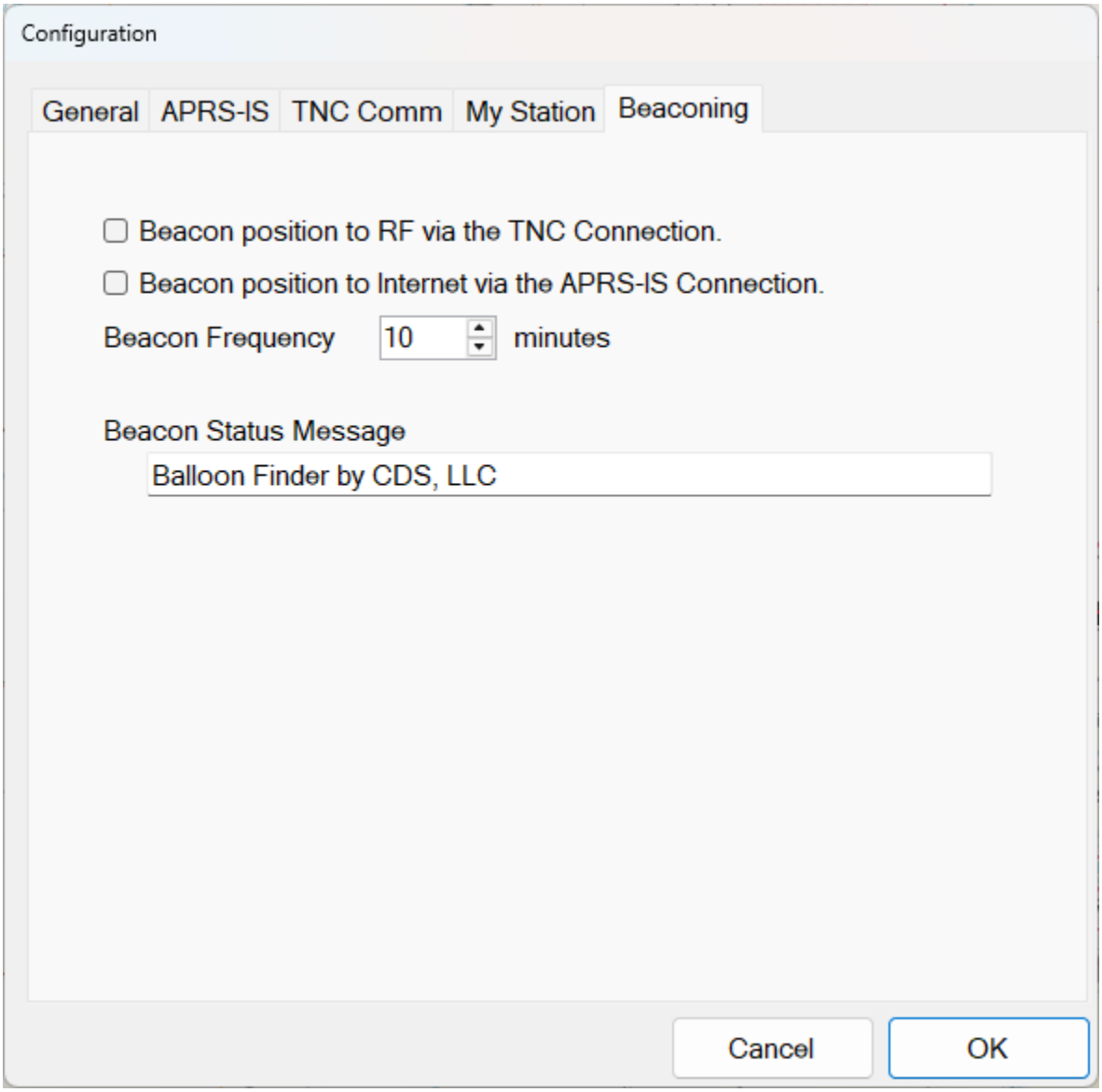
Any NMEA-standard GPS that can be attached to the laptop or tablet will work. The GPS positioning area is where you would configure the Comm Port and baud rate of the GPS.



When Balloon Finder is initially launched (and before the GPS is enabled), the software will use the Stationary lat/lon coordinates to position itself on the map ("Me"). When the GPS Comm port is opened, then the software will begin to use the connected GPS for position information, and the "Me" will track the GPS position on the map.

Beaconing

If you wish to have Balloon Finder transmit (or “beacon”) your position to the world, that can be enabled in the Beaconing tab. You can optionally chose to have beacons transmitted over the RF channel using the TNC, and/or just transmitted over the APRS-IS internet connection. The frequency of the beacon can be configured in Minutes, and an optional status message can be tacked on the end of the beacon.

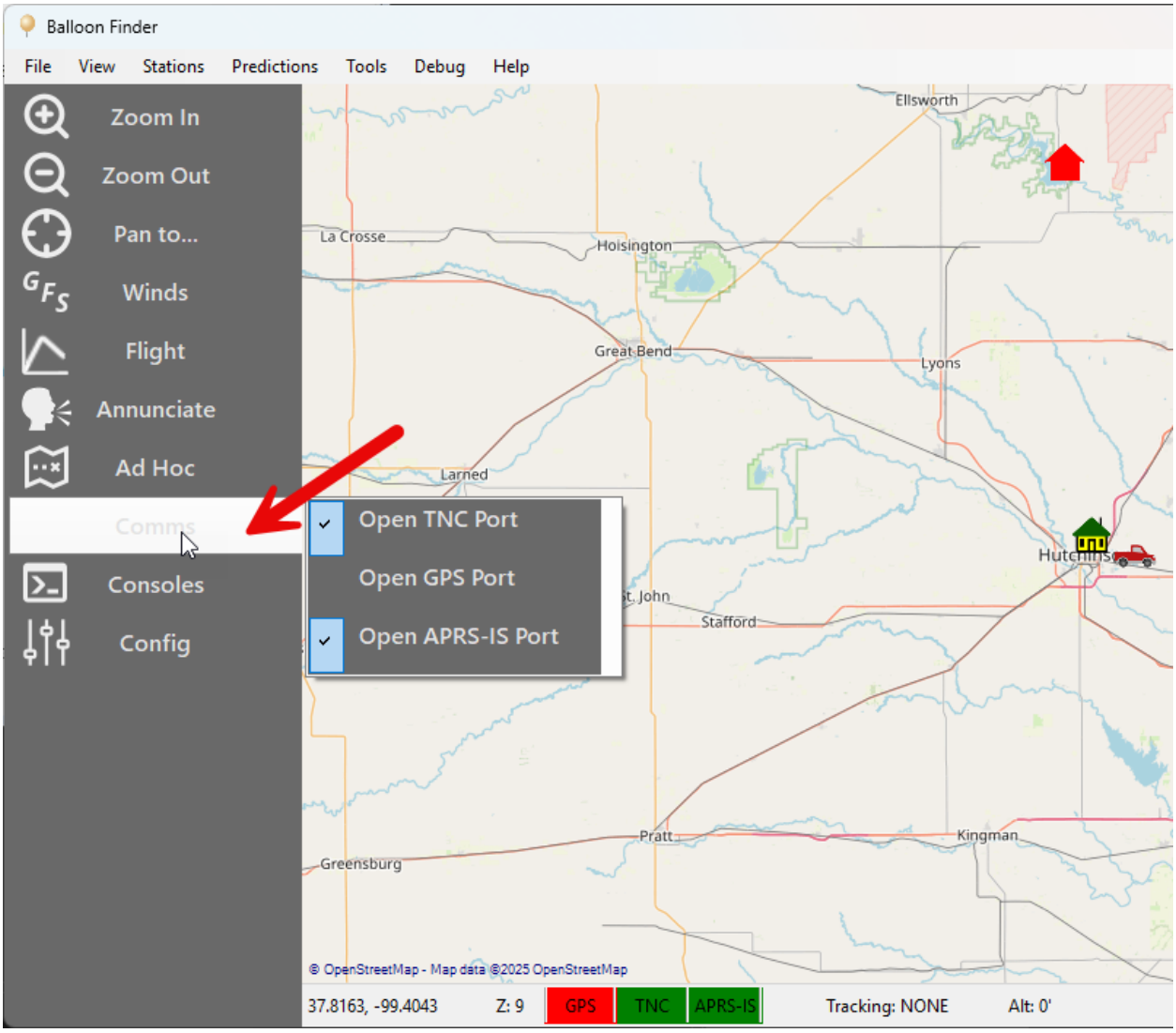

Configuration
General
APRS-IS
TNC Comm
My Station
Beaconing
Beacon position to RF via the TNC Connection.
Beacon position to Internet via the APRS-IS Connection.
Beacon Frequency
10
minutes
Beacon Status Message
Balloon Finder by CDS, LLC
Cancel
OK

Using Balloon Finder

Receiving Data

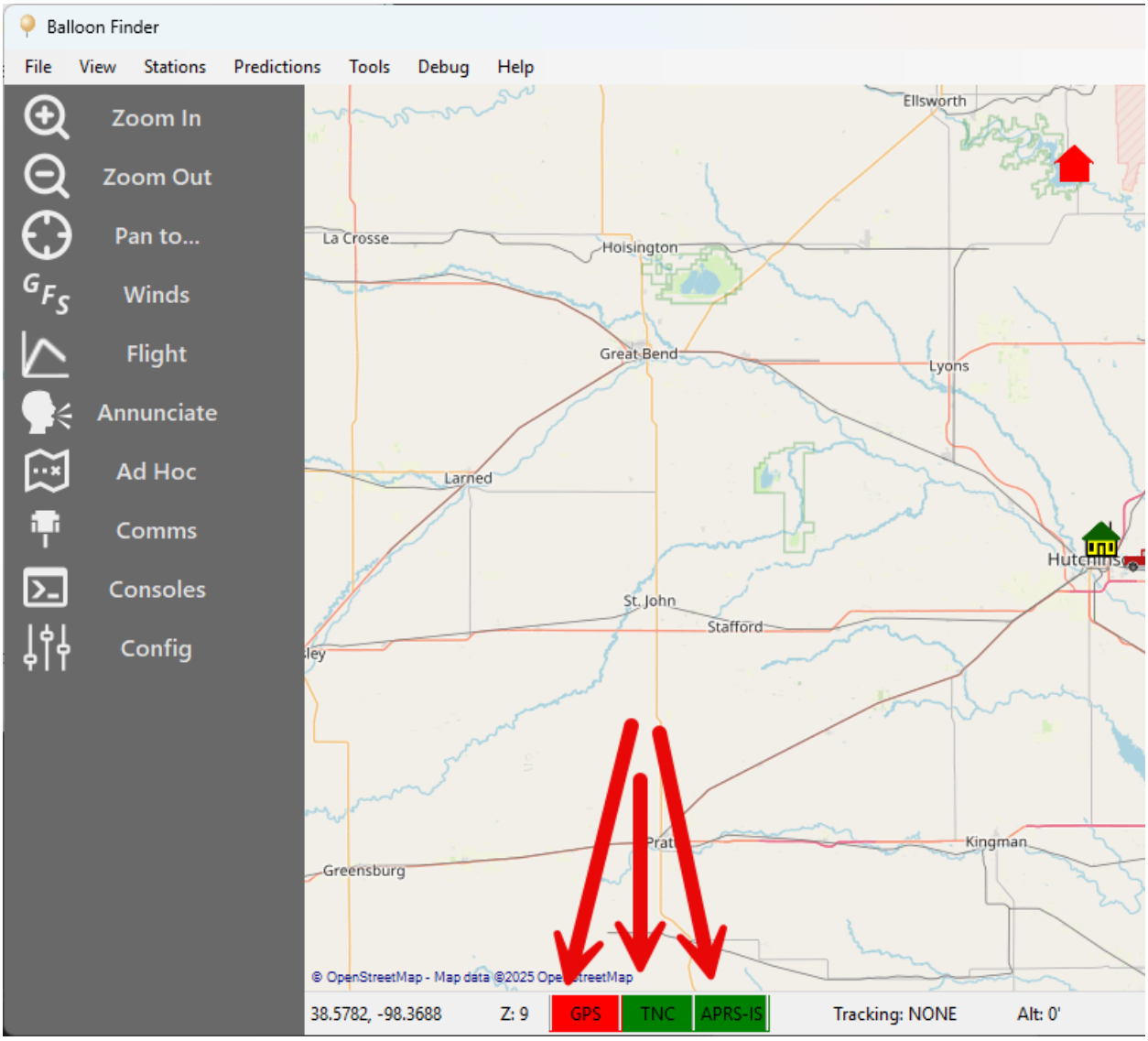
Once the Balloon Finder software has been configured, the external sources can be connected to Balloon Finder.

To connect the TNC, GPS, or APRS-IS (Internet feed), click the Comms button from the left-hand pane. A sub-menu will appear showing those three options along with checkmarks showing the current state of the connection. Those buttons serve as toggles, and will disconnect if the connection was already connected.



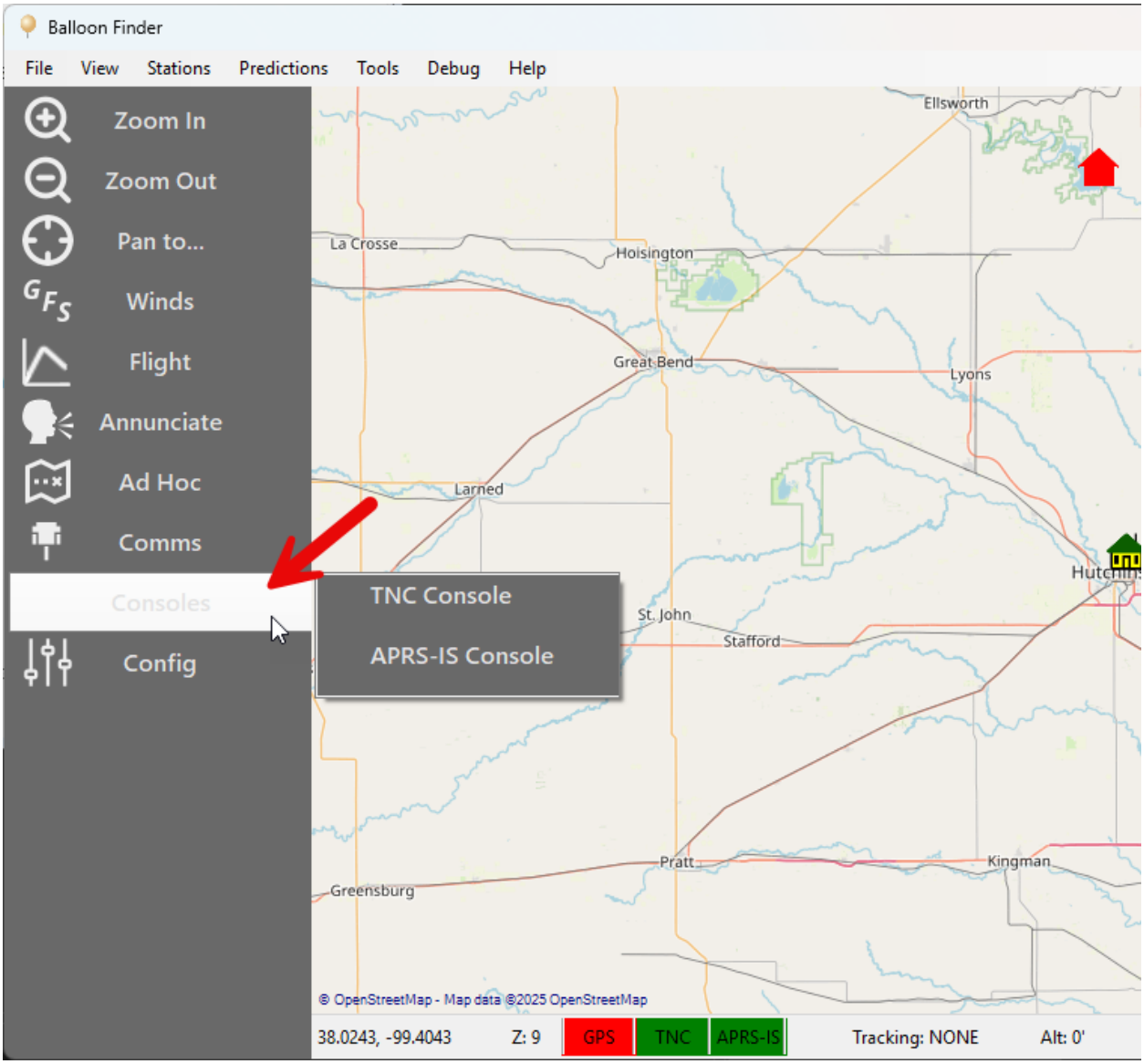
When the GPS is configured and connected, position data from the GPS will override the stationary location that is configured inside of the Configuration screen, under the My Station tab.

You can always see the current status of the three communication devices at the bottom of the main window. A green status indicates that the connection is operational, and a red status indicates that is disconnected and no longer passing data.

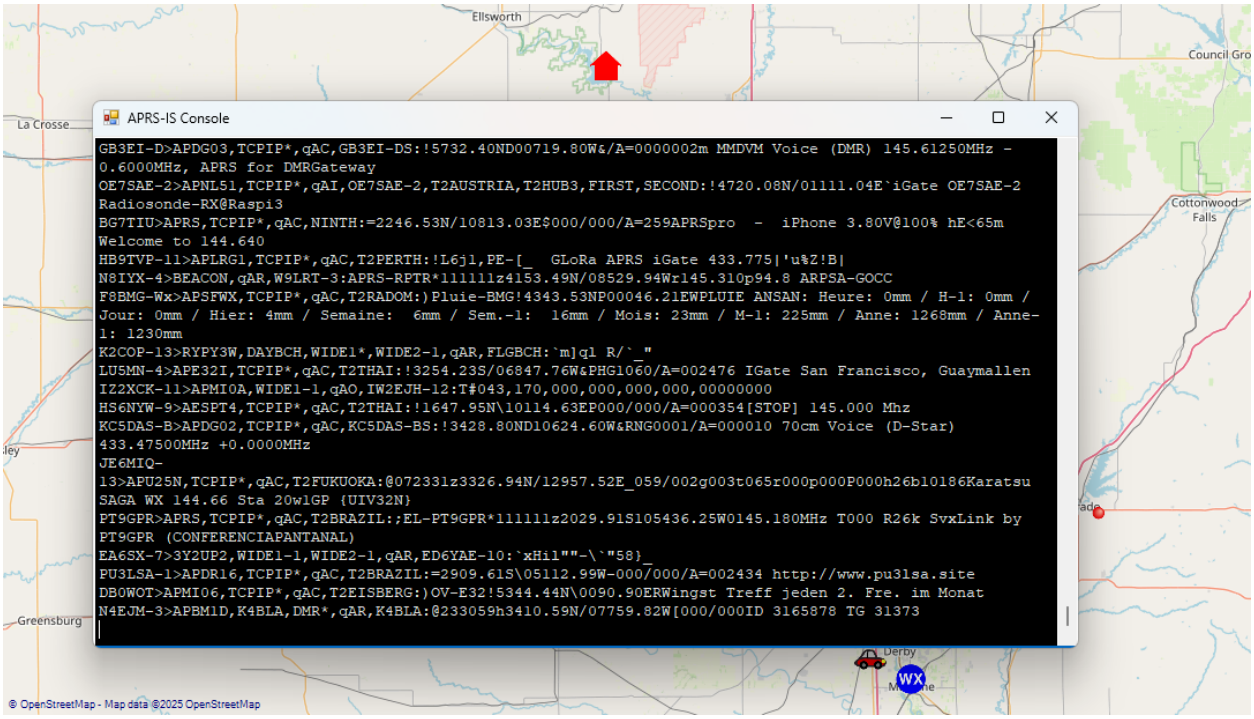


Inspecting the Communications

You can check the data flow to and from the TNC or the APRS-IS internet server by clicking on Consoles in the left-hand pane. That will show a sub-menu that gives you the option to see the Consoles for either the TNC or the APRS-IS.



A new window will open up, and any traffic being received from the corresponding communication channel will show in the Console.

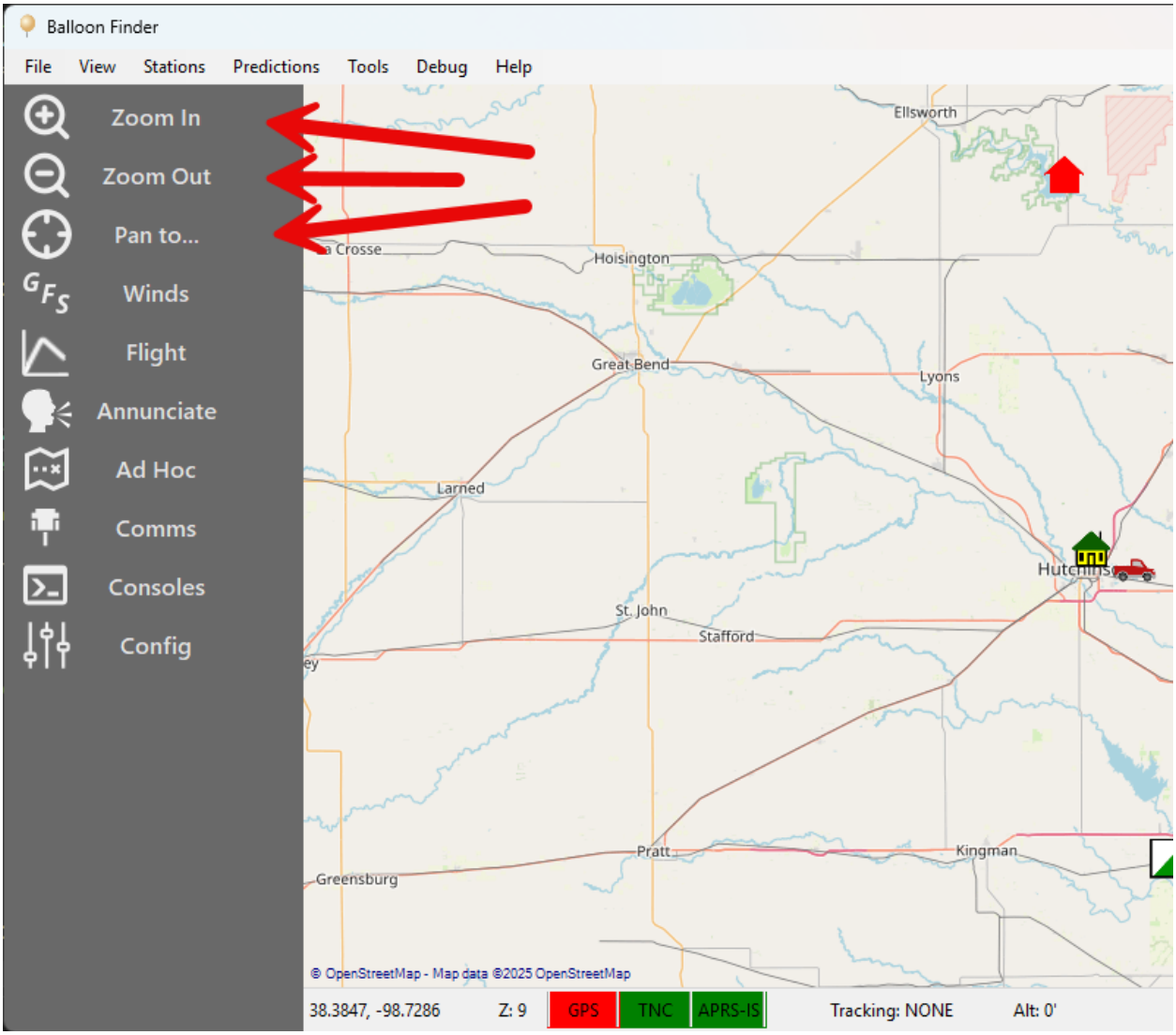


Using the Map

Balloon Finder uses open-source map files provided by the OpenStreetMap project. The User Interface to the map is very similar to any online mapping tool that you may already be familiar with. You can use your mouse to click-and-drag the main map area to reposition the map, and the scroll wheel on the mouse will zoom in or out.

If you have a touch screen computer, you can easily use your fingers to also navigate the map.

There are three tools in the left-hand pane that can help you navigate the map, or to quickly reposition yourself if you get lost. They allow you to easily Zoom In, Zoom Out, or “Pan to…”



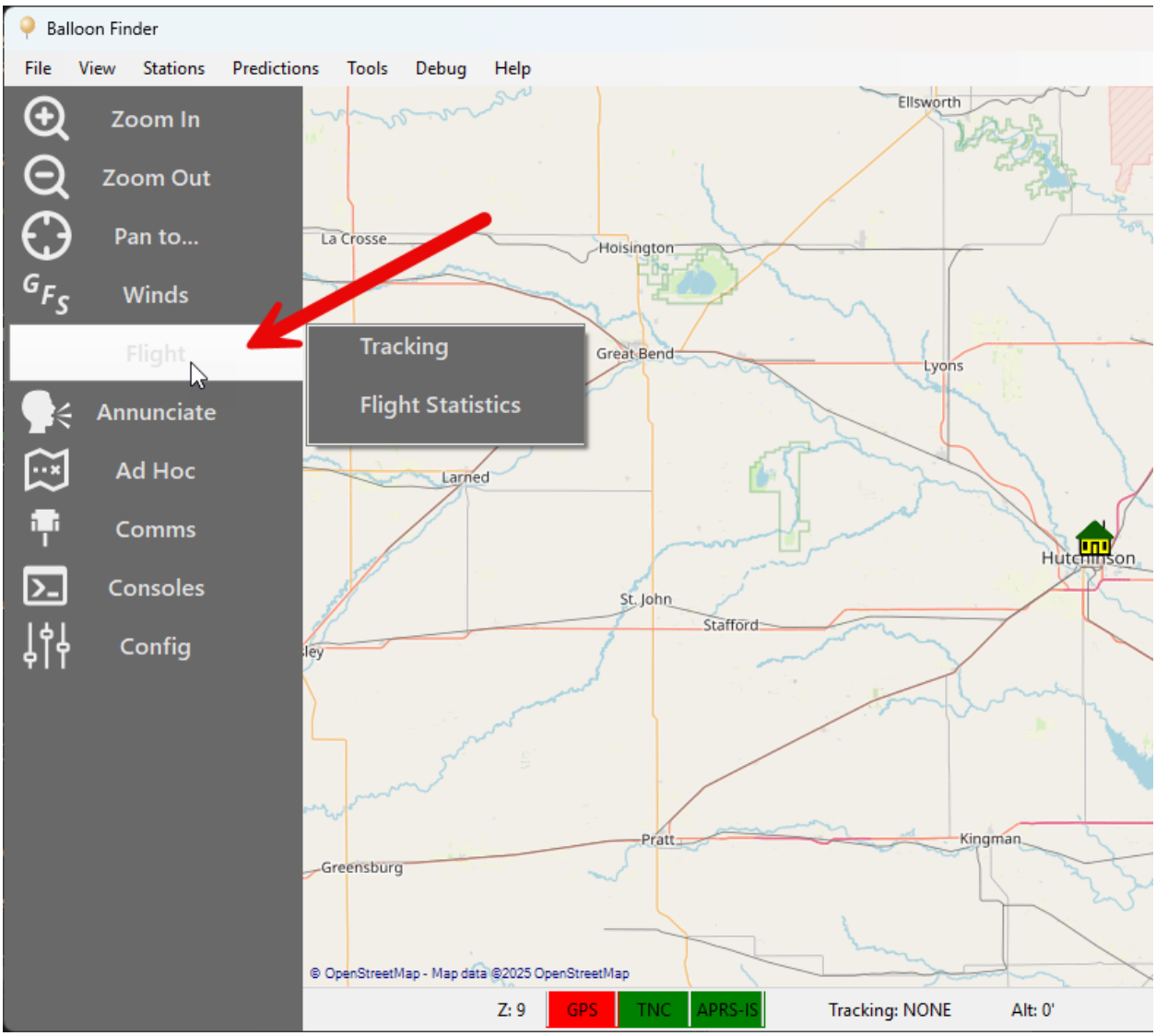
The Pan To... option lets you quickly reposition the map.

- Me – The My Station location that was configured, or if you are connected to a GPS for live positions, your current location according to the GPS.
- Balloon – This will take you to the current location of the Primary Tracked Balloon.
- Landing Prediction – This will take you to the position that the Primary Tracked balloon is expected to land.

Tracking a Balloon

By default, all stations that are heard via the TNC or APRS-IS are displayed on the Balloon Finder map. This would include high altitude ballons and other moving APRS object.

However, Balloon Finder has been specifically designed to provide a rich user experience when tracking a balloon flight. To begin tracking a balloon, start by going to Flight in the left-hand pane. A sub-menu will appear.

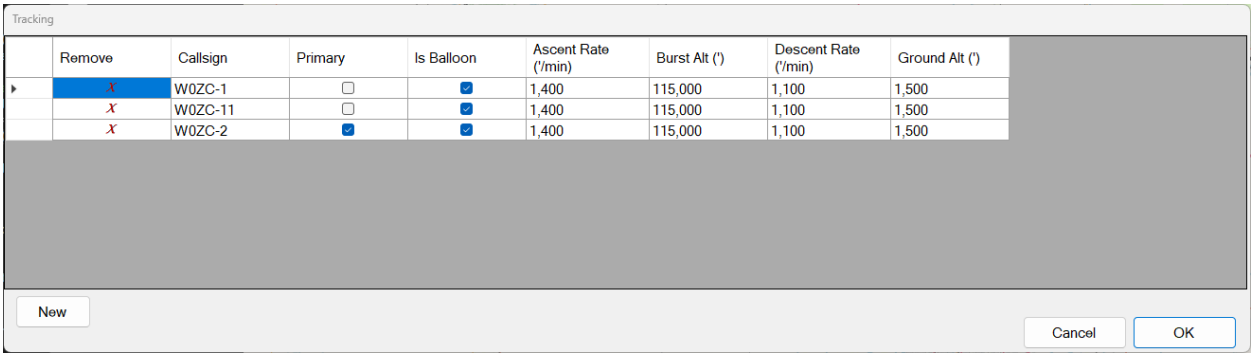


The Tracking window will appear if you click on Tracking, and that allows you to specify which APRS balloon objects that you'd like to track, and to specify some basic flight parameters of them.

There is always one Primary Tracked balloon, which is the one that predictions are calculated on and other flight data is reported at the bottom of the screen. Secondary Tracked stations can also be defined.

Any station that is designated as “Tracked” enables:

- Logging of received data in the Logs directory, making it convenient to study flight data after the fact.
- A quick way to swap from a secondary tracked station to the Primary, in the event that communications would be lost with the Primary, and a new Primary would need to be declared.



To add another tracked station, click the New button at the bottom and enter the callsign of the balloon. It will add it to the grid shown above.

Once it’s in the grid, you can enter the Ascent Rate, estimated Burst Altitude, and the descent rate. The Ground Altitude column indicates at what altitude should the predictions stop descending.

The Is Balloon field would normally be left checked, but if you wanted to log data on another station that didn’t happen to be a high altitude balloon, you could uncheck that box to prevent flight predictions from occurring.

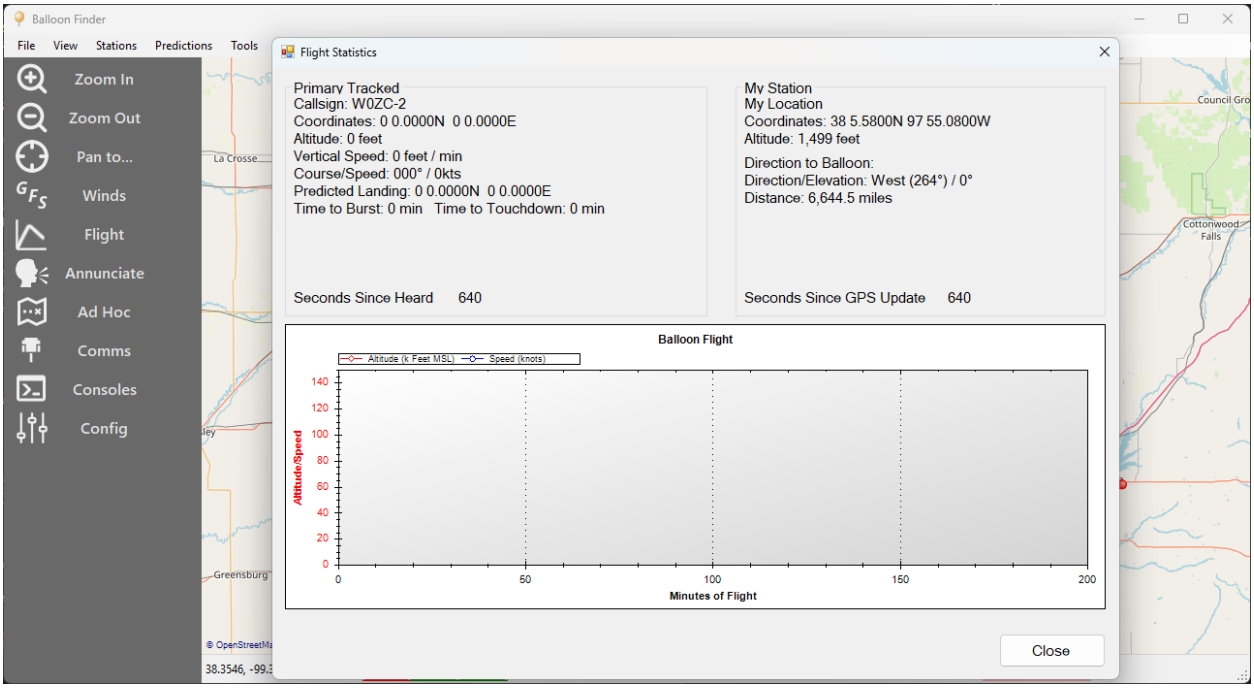
The Primary checkbox indicates which of the stations being tracked is Primary. The Primary station is the one that flight statics and flight predictions are calculated on.

Nothing will happen immediately until the first packet from that tracked station is heard and decoded. Going forward, any time you receive a packet from the balloon a sonar-type "ping" sound will be played from the PC speakers to give audible confirmation that packets are being received.

The flight predictions will be inaccurate at this point until Winds Aloft data is loaded into Balloon Finder. See the next section Flight Predictions – Importing Winds Aloft for more information.

Flight Statistics

Once a balloon is being tracked, you can go to the Flight button in the left-hand pane, and select Flight Statistics. That will open a new window that will show a host of parameters about the flight, including a line graph showing the balloon's altitude over time.

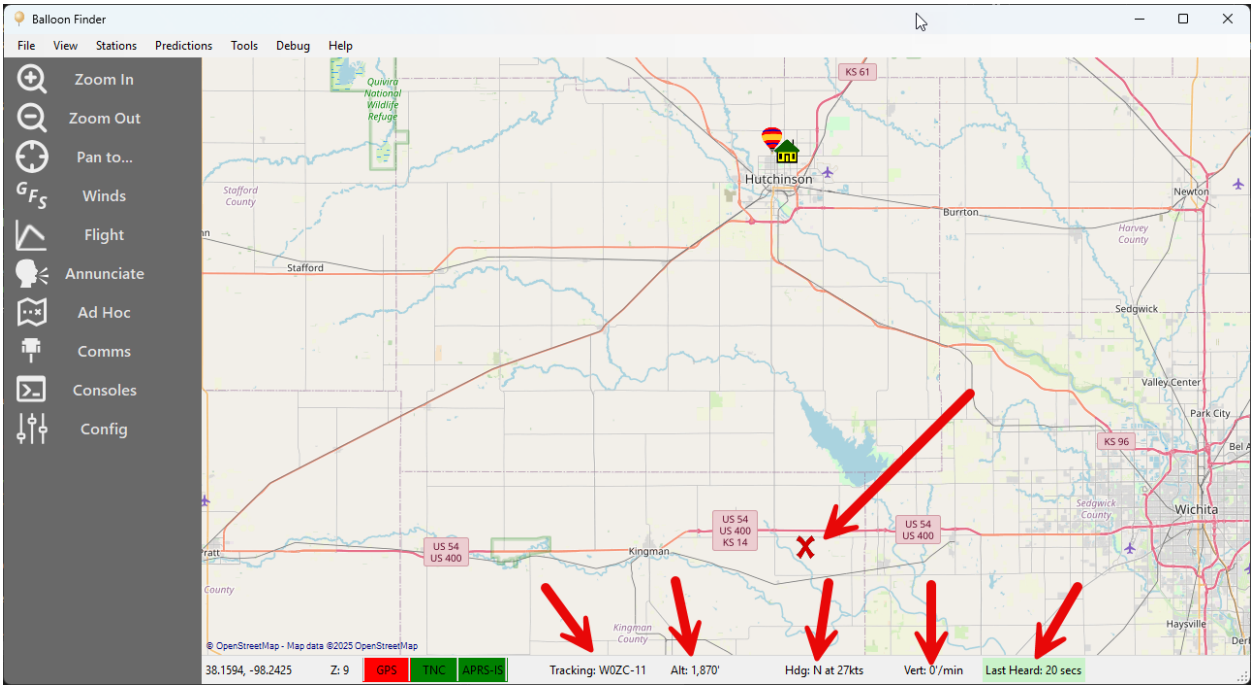


Alternatively, many of the key flight statistics are also presented on the main screen along the bottom of the map.

From left to right:

- The callsign of the Primary Tracked balloon
- The Altitude of the balloon
- The course and speed of the balloon in the air
- Vertical speed, which is averaged over the past 20 position reports
- How many seconds it's been since the Primary Tracked station was last heard

Additionally, a Red X will mark the predicted landing spot of the balloon, based on a combination of encountered winds, as well as the winds forecasts that are loaded into Balloon Finder. For more information on loading the Winds, see Flight Predictions – Importin Winds Aloft.

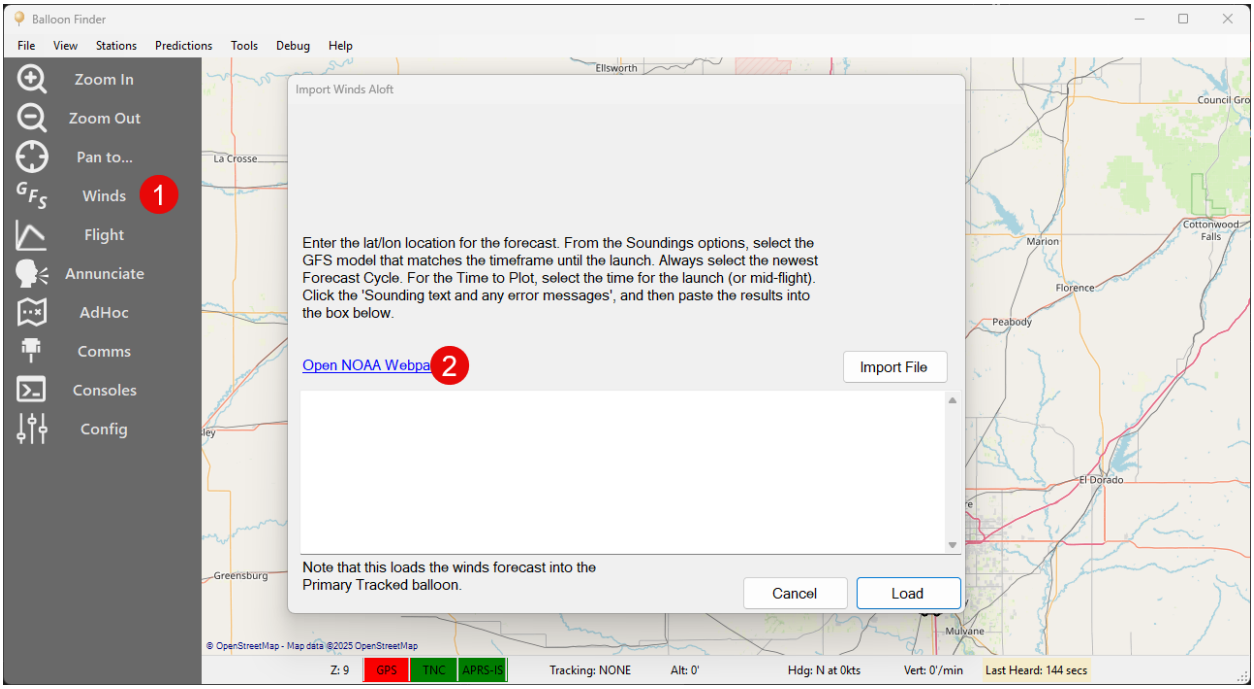

Balloon Finder
File
View
Stations
Predictions
Tools
Debug
Help
Zoom In
Zoom Out
Pan to...
Winds
Flight
Annunciate
Ad Hoc
Comms
Consoles
Config
Hutchinson
Burrton
Newton
Harvey County
Stafford
Stafford County
Sedgwick
Valley Center
Park City
Wichita
Sedgwick County
Kingman
Kingman County
KS 61
KS 96
US 54
US 400
KS 14
Haysville
© OpenStreetMap - Map data ©2025 OpenStreetMap
38.1594, -98.2425
Z: 9
GPS
TNC
APRS-IS
Tracking: W0ZC-11
Alt: 1,870'
Hdg: N at 27kts
Vert: 0'/min
Last Heard: 20 secs

Flight Predictions

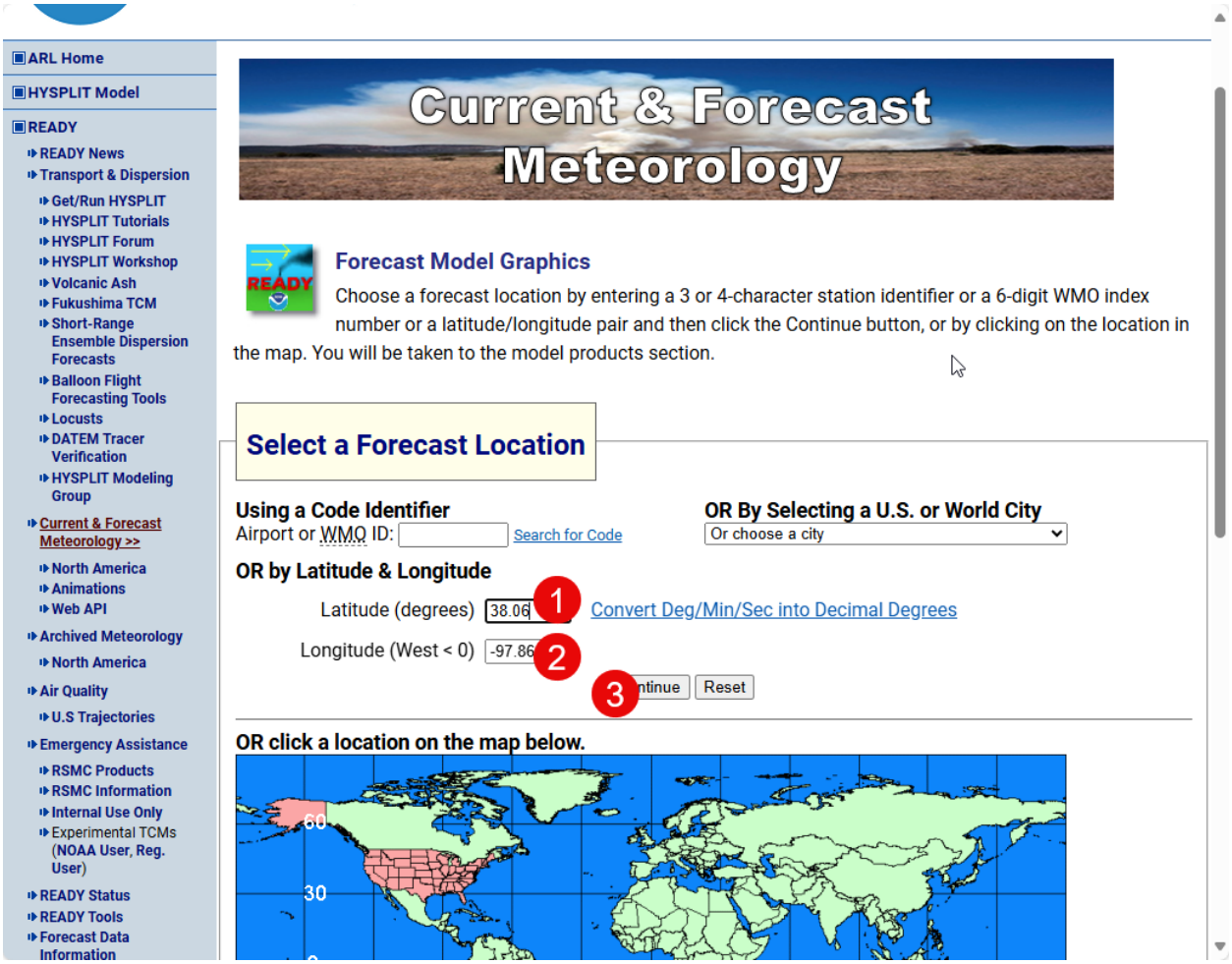
Importing Winds Aloft

Balloon Finder is capable of running flight predictions in a couple of different scenarios. To do this, it is generally recommended to use the forecast Winds Aloft data provided by the NOAA, known as the GFS models.

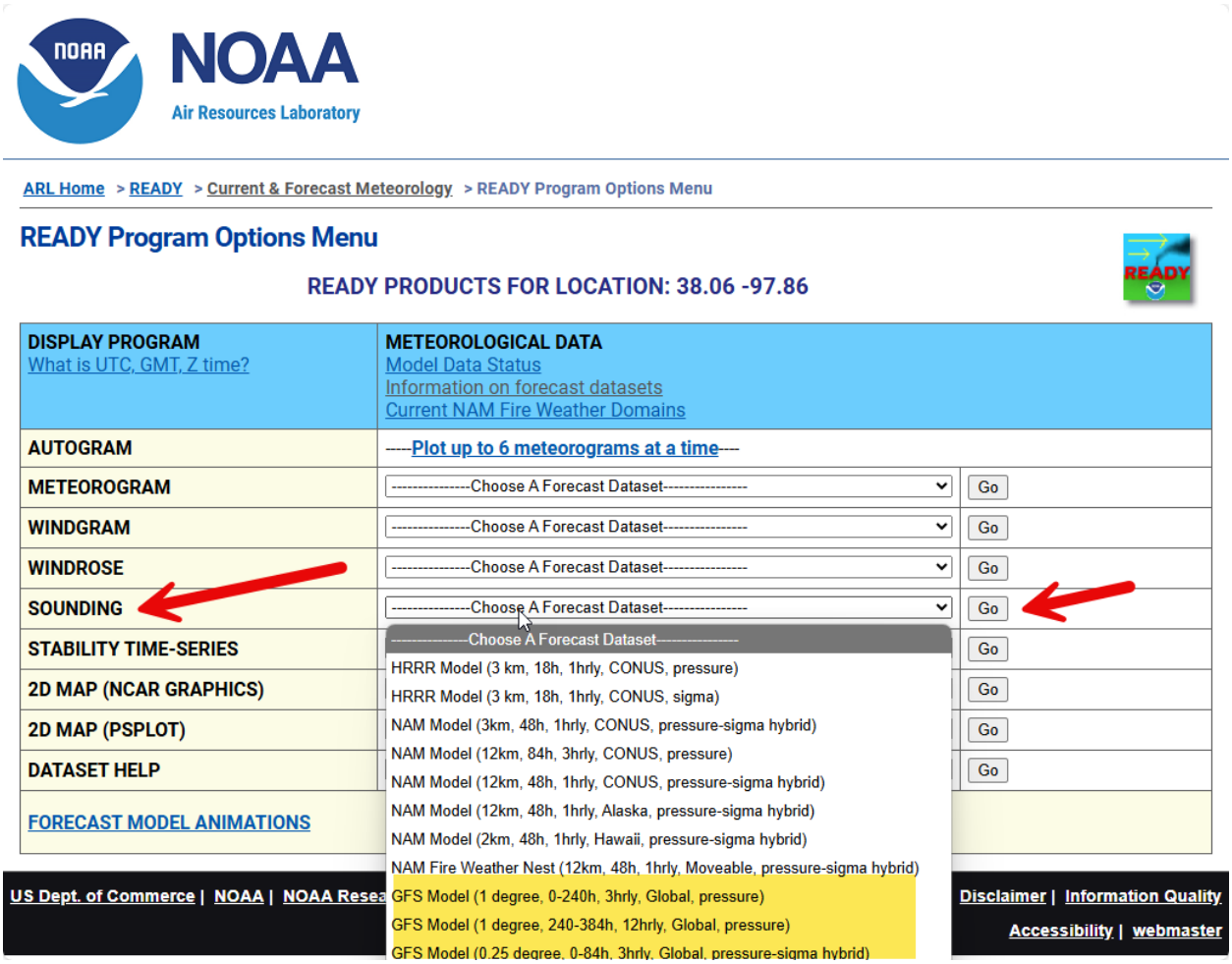
To import the winds data, click on the Winds button from the left-hand panel. This will bring up the Import Winds Aloft screen, where you will find a link to the NOAA's website for downloading the forecasts.



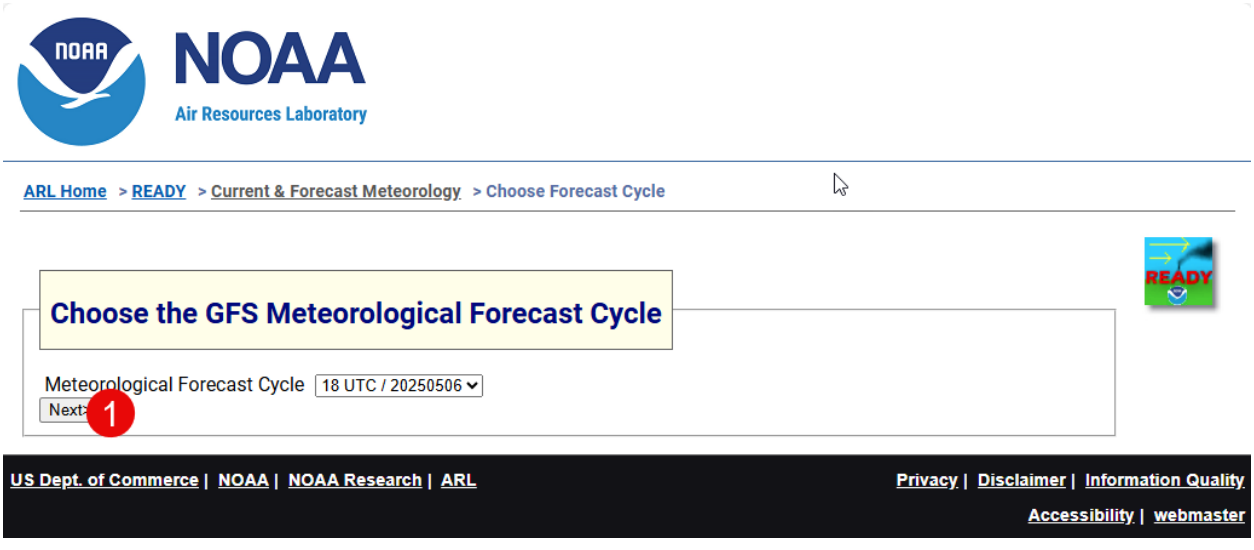
From the NOAA's website, enter the Latitude and Longitude for the forecast that you want to generate. This is normally the lat/lon of the launch site, although if you expect the ballon to travel significant distance, you may opt to choose a location along the balloon's expected flight path. Once entered, click Continue.



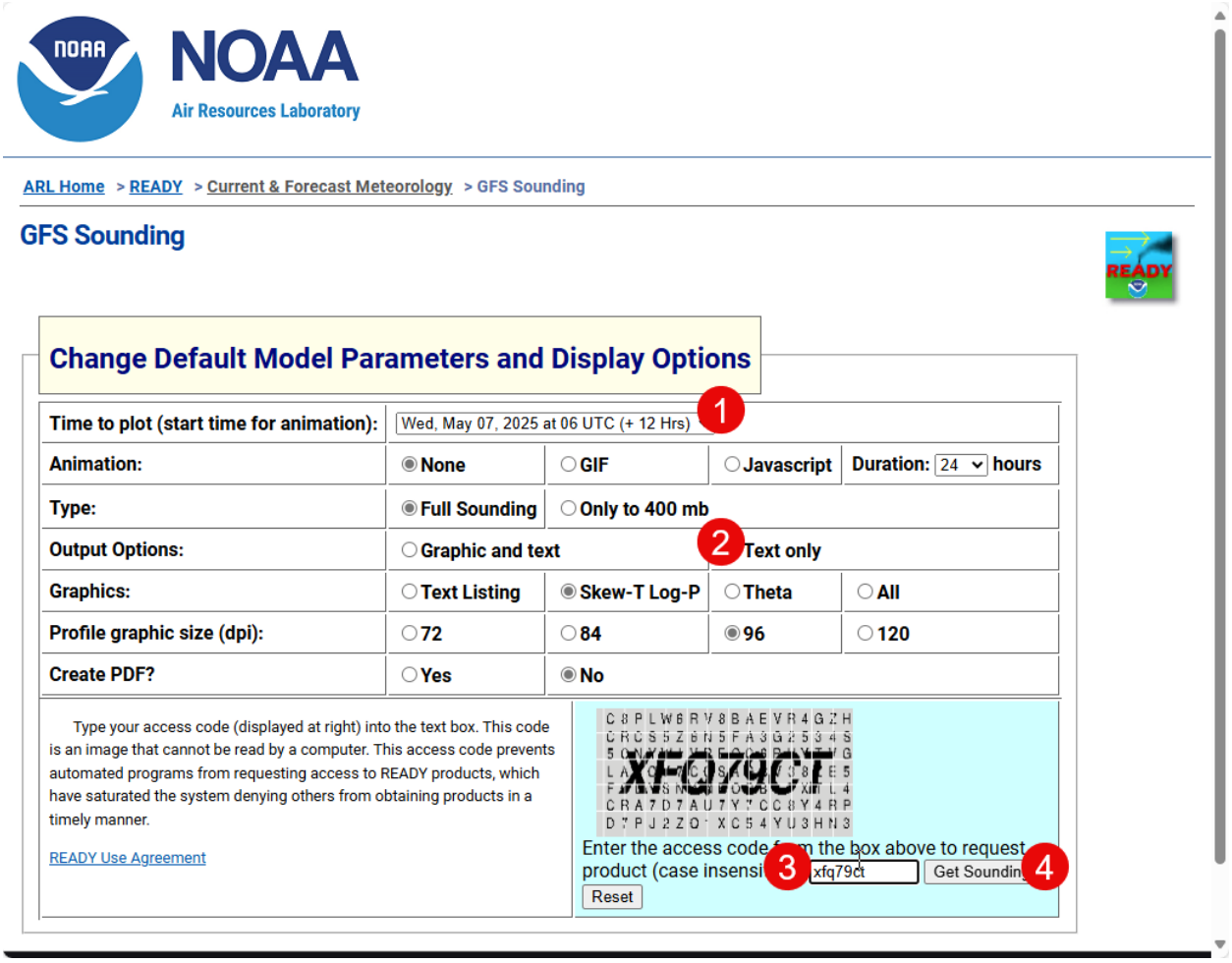
Scroll down to the Sounding row in the grid, and select either the GFS 192-384 Model or the GFS 0-192 Model, depending on whether you are forecasting out less than 192 hours in advance, or less. If you are intending to use the forecast data for a flight that is happening or getting ready to happen, use the 0-192 model and select the soonest forecast period on the upcoming screens. When ready, press the Go button.



On the third page, normally you will use the default value, which was the most recent forecast cycle. Click Next.

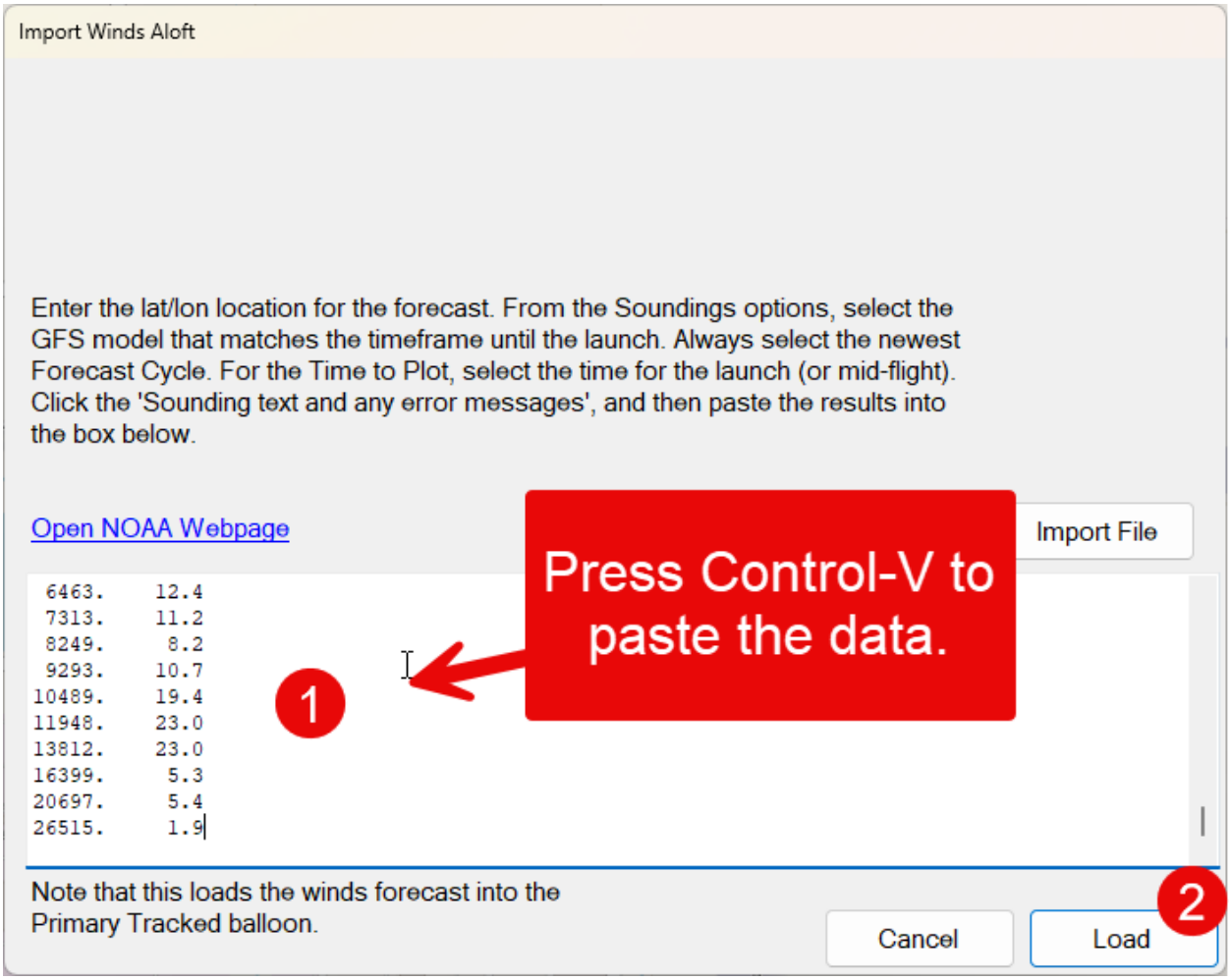


Here is the final page to select the data that you want the forecast information for. Select the date and time to pull the forecast winds for in the Time to Plot drop-down. Generally, all of the other options can be left as the default. You will need to scroll down and enter the CAPTCHA in the lower right portion of the window. Click Get Sounding when ready.



The wind forecast information will now be displayed in textual format and can be copied over to Balloon Finder directly.

Returning to the Balloon Finder Import Winds Aloft screen, paste the data into the text box by clicking in the box, and pressing Control-V on the keyboard. When it's pasted, press the Load button at the bottom.



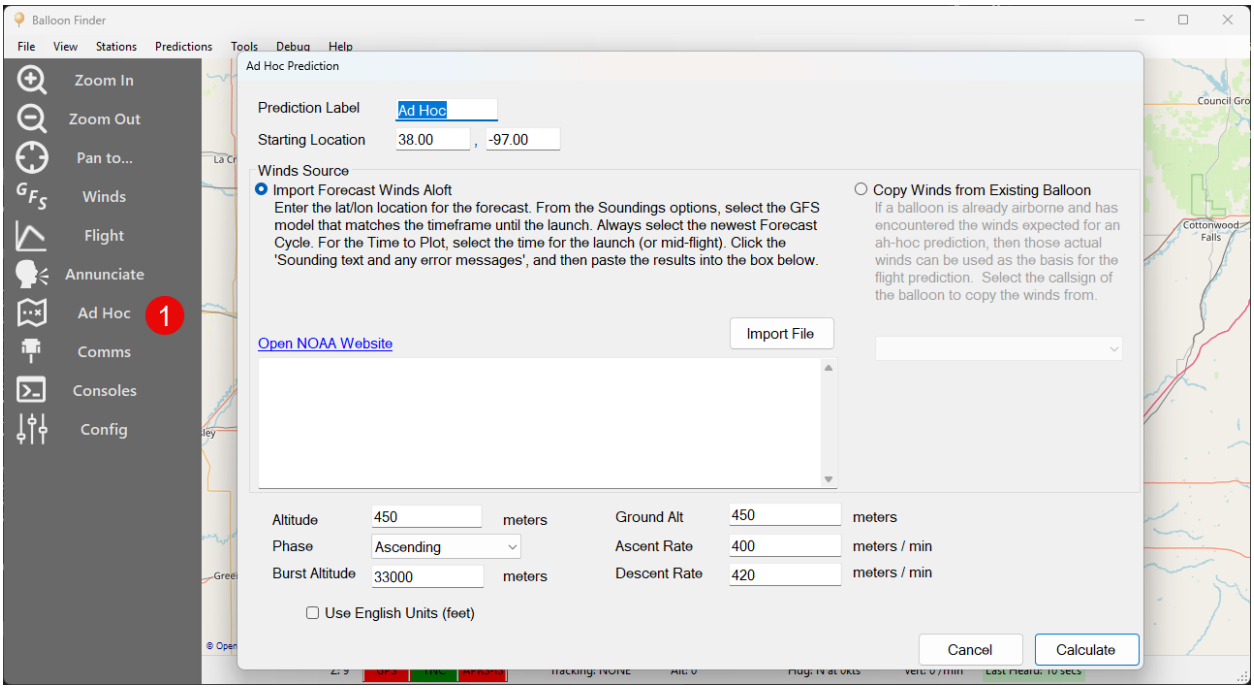
Running Ad Hoc Predictions

Ad-hoc predictions are a powerful feature that can be used for a variety of ballooning situations. The most common two are to predict a future flight and to predict the path of a balloon that has gone missing.

Before a prediction can be run, the winds aloft data needs to be fed into the predictor. This can be accomplished in two ways:

- Wind forecasts can be downloaded from the NOAA's website
- Winds can be copied from another flight that is currently or recently airborne

To run an Ad Hoc prediction, click the Ad Hoc button on the left-hand panel.

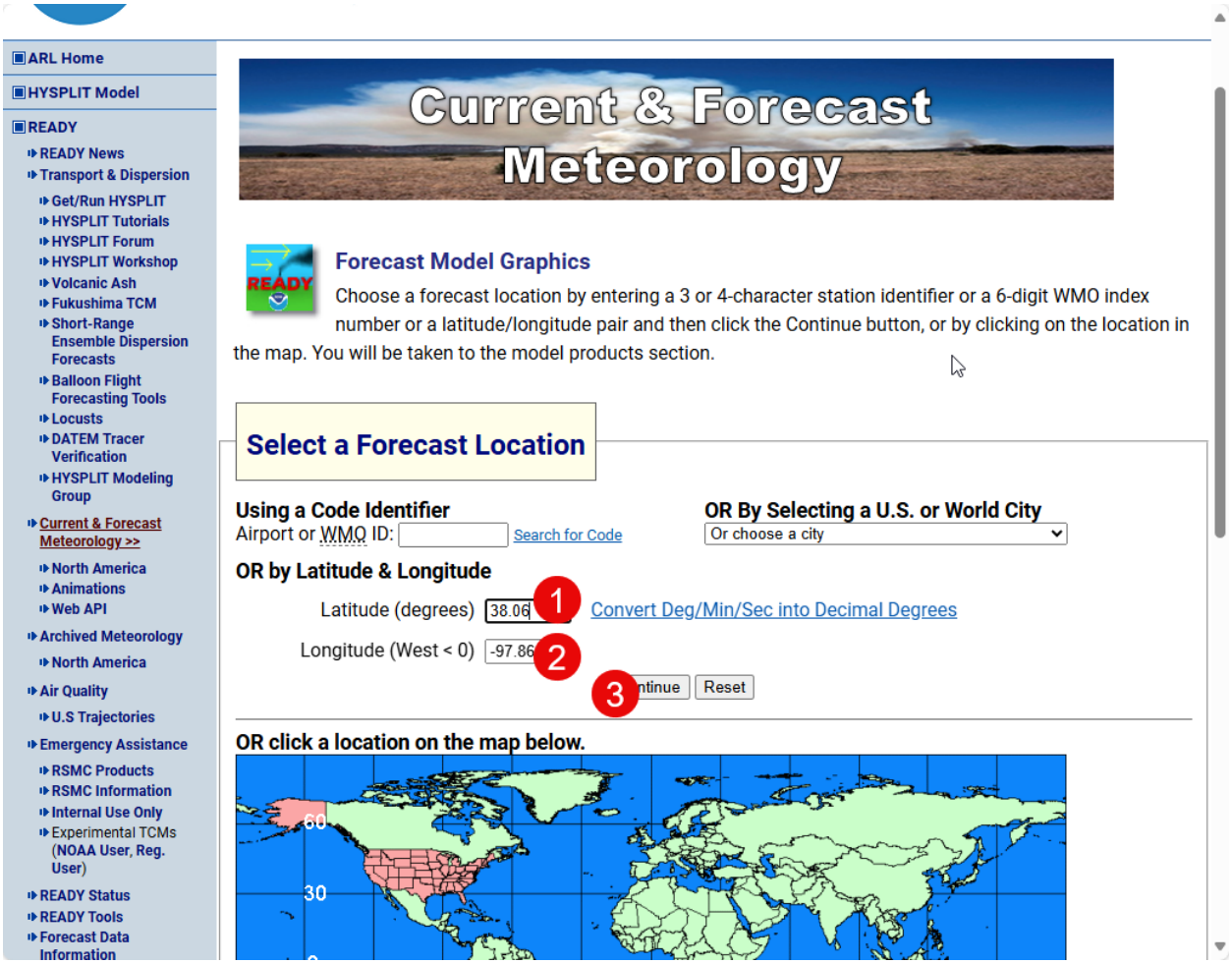


In the top section of the Ad Hoc form, enter a label for the prediction and a starting lat/lon location. Normally the lat/lon would be the launch location for the flight, however if you are attempting to locate a balloon based on a last known position, you may want to adjust this data accordingly.

The Winds Source section determines if you are downloading wind forecasts from the NOAA, or if you are going to copy actual winds encountered from another balloon flight. Copying from another balloon would only be effective in situations where you had multiple balloons being launched from the same location, around similar times on the same day.

To download the GFS winds forecasts from the NOAA, click the Open NOAA Website link on the form.

From the NOAA's website, enter the Latitude and Longitude for the forecast that you want to generate. This is normally the lat/lon of the launch site, although if you expect the ballon to travel significant distance, you may opt to choose a location along the balloon's expected flight path. Once entered, click Continue.



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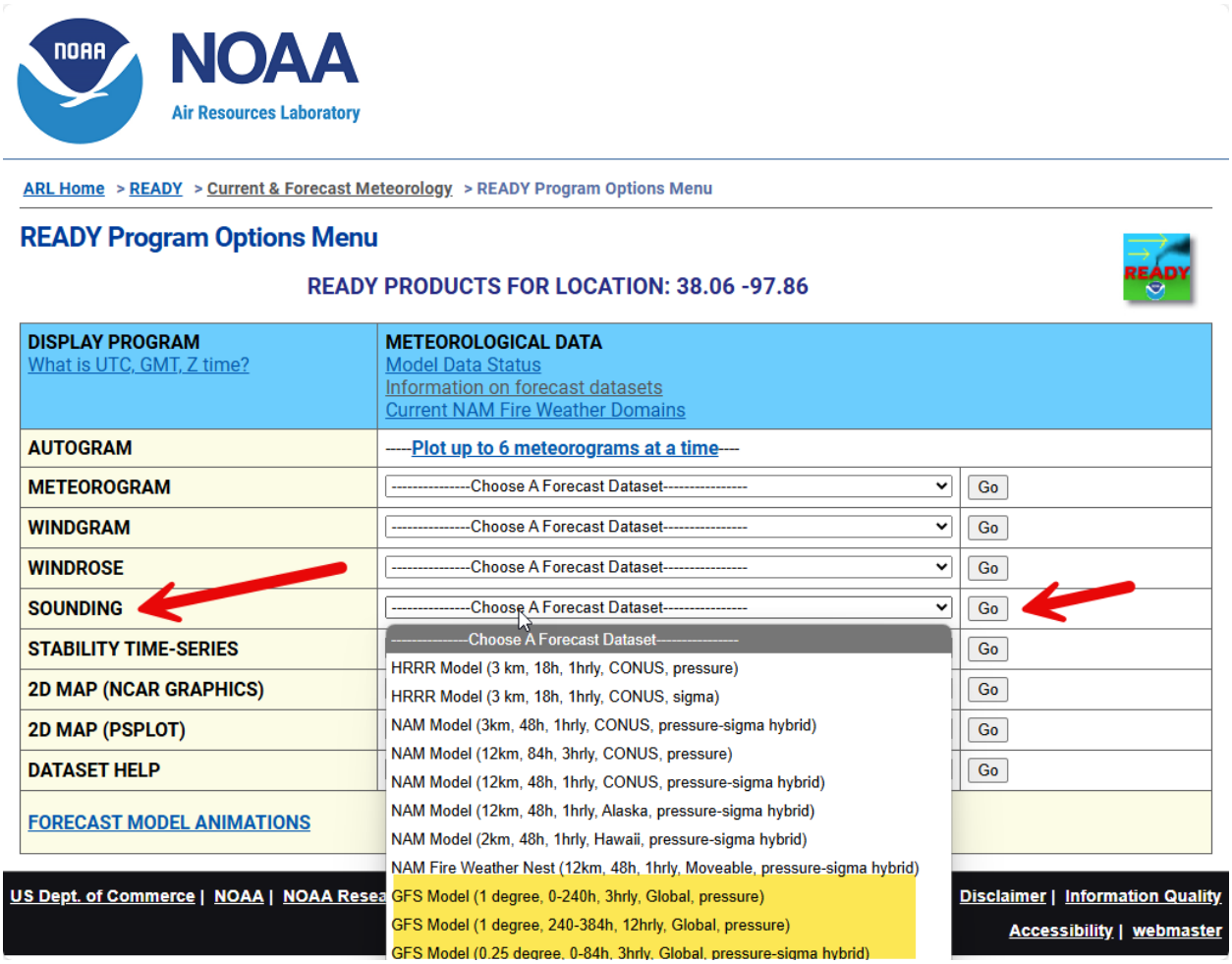

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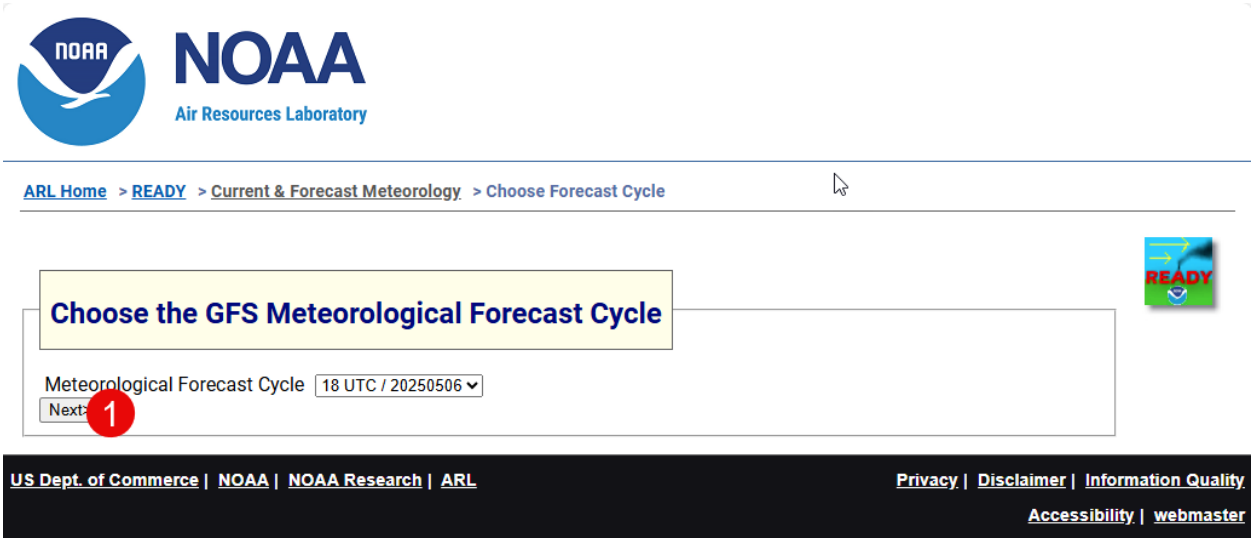

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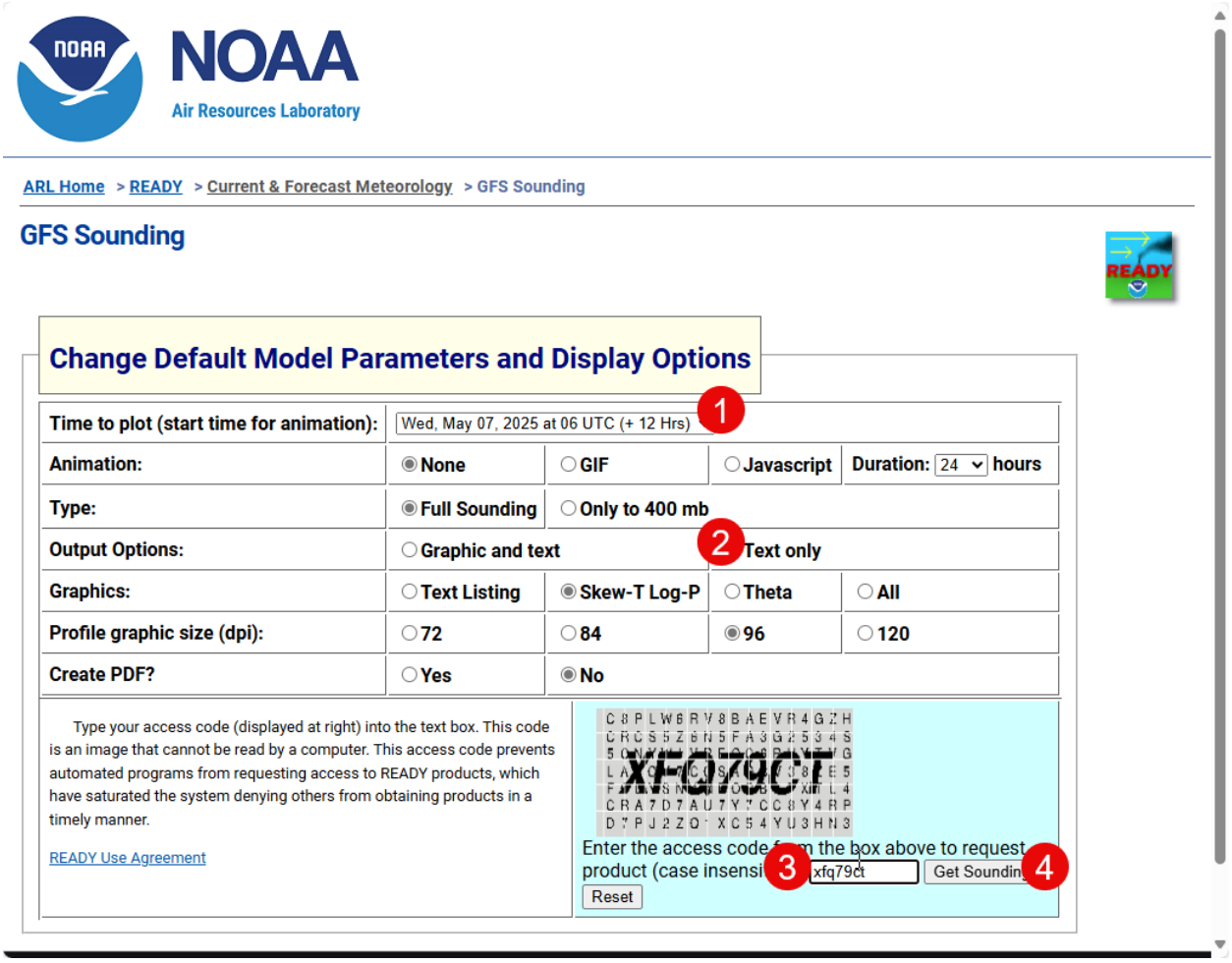
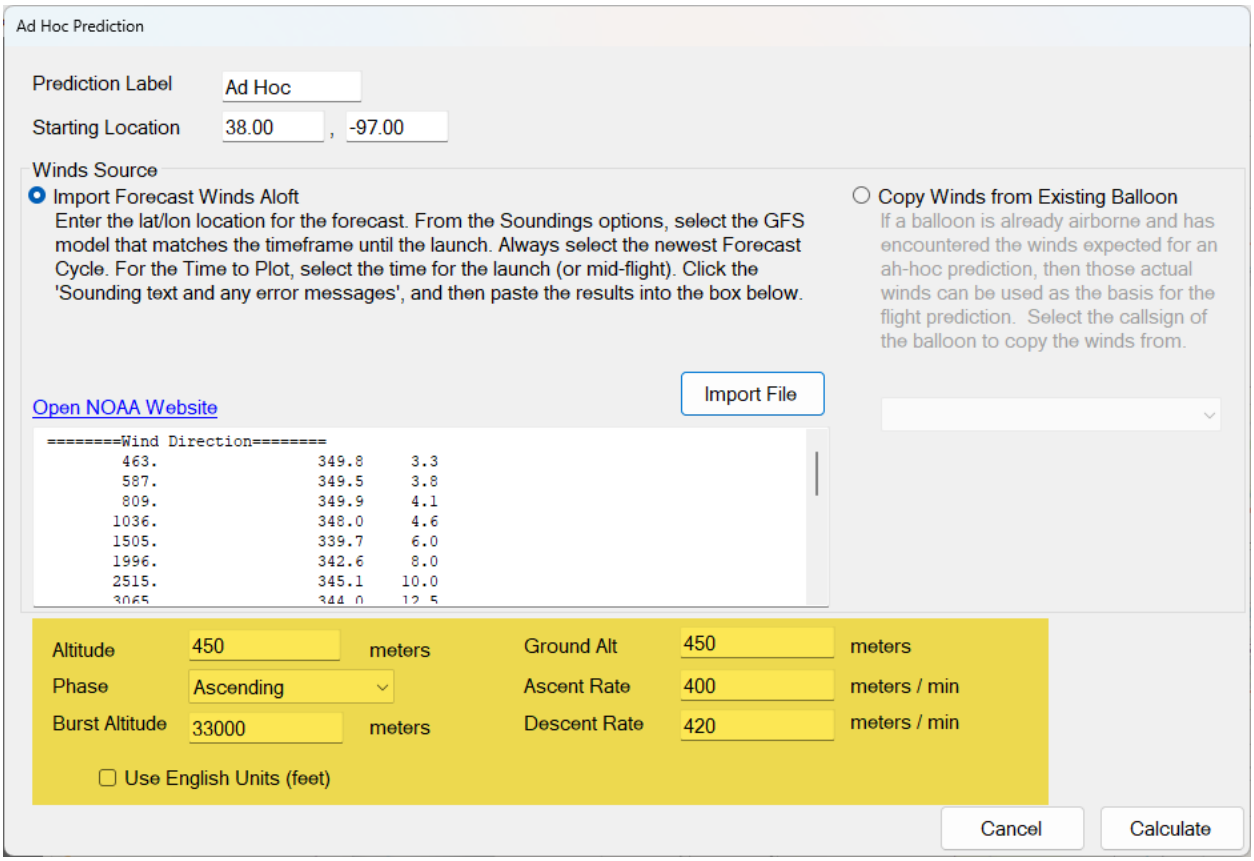


The wind forecast information will now be displayed in textual format and can be copied over to Balloon Finder directly.

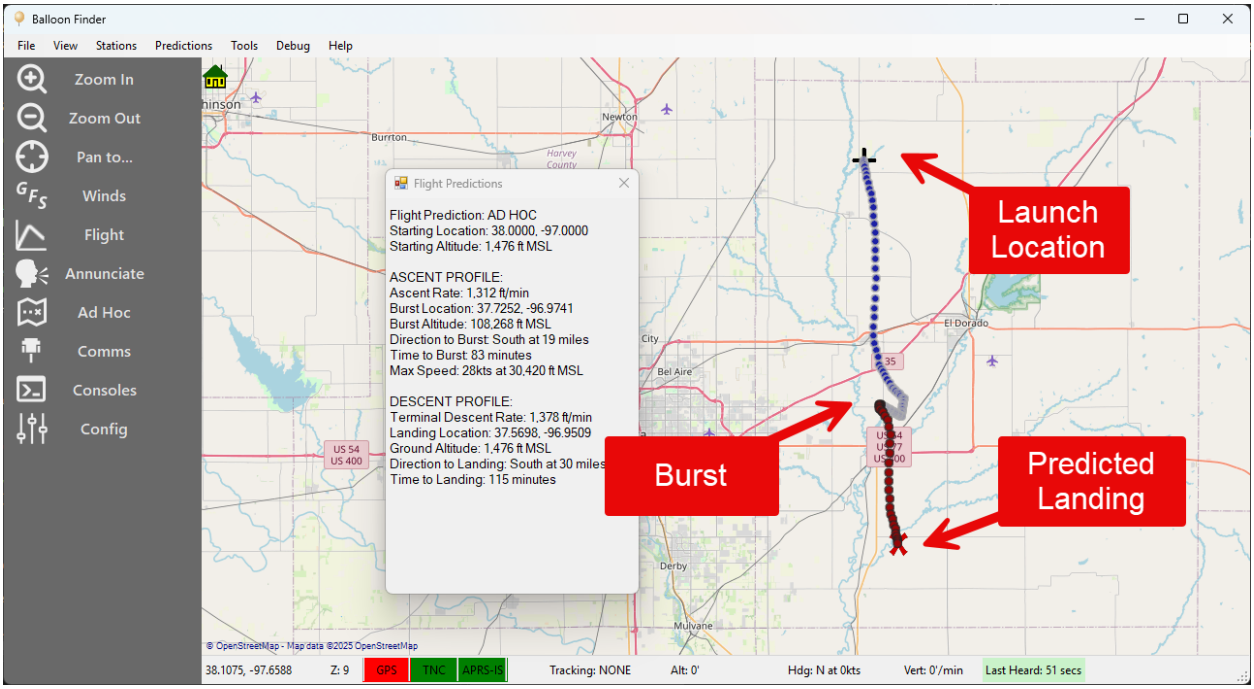
Returning to the Balloon Finder Import Winds Aloft screen, paste the data into the text box by clicking in the box, and pressing Control-V on the keyboard.



The bottom portion of the Ad Hoc window defines where the balloon is at and how to process the predictions.

- Altitude – The current altitude of the balloon. If you are predicting a flight from launch to touchdown, then this altitude would be the altitude of the ground.
- Phase – Whether or not to assume that the balloon is still going up (Ascending), or whether to assume that the balloon has burst and it is now falling (Descending).
- Burst Altitude – The estimated bursting altitude of the balloon. This parameter is irrelevant if you selected “Descending” for the Phase.
- Ground Altitude – The elevation of the ground where you expect the balloon to land.
- Ascent Rate – The expected rate of climb for the balloon. This parameter is irrelevant if you selected “Descending” for the Phase.
- Descent Rate – The terminal rate at which the balloon will be falling. Due to the nature of high altitude ballooning, the descent rate of the package immediately after burst will be very high. As the parachute and payload descends into thicker air, the descent rate will gradually decrease until it eventually lands. This Descent Rate is the rate that is expected at the time of landing.

Click the Calculate button at the bottom of the window. That window will disappear, and the resulting flight forecast will be displayed on the map.



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