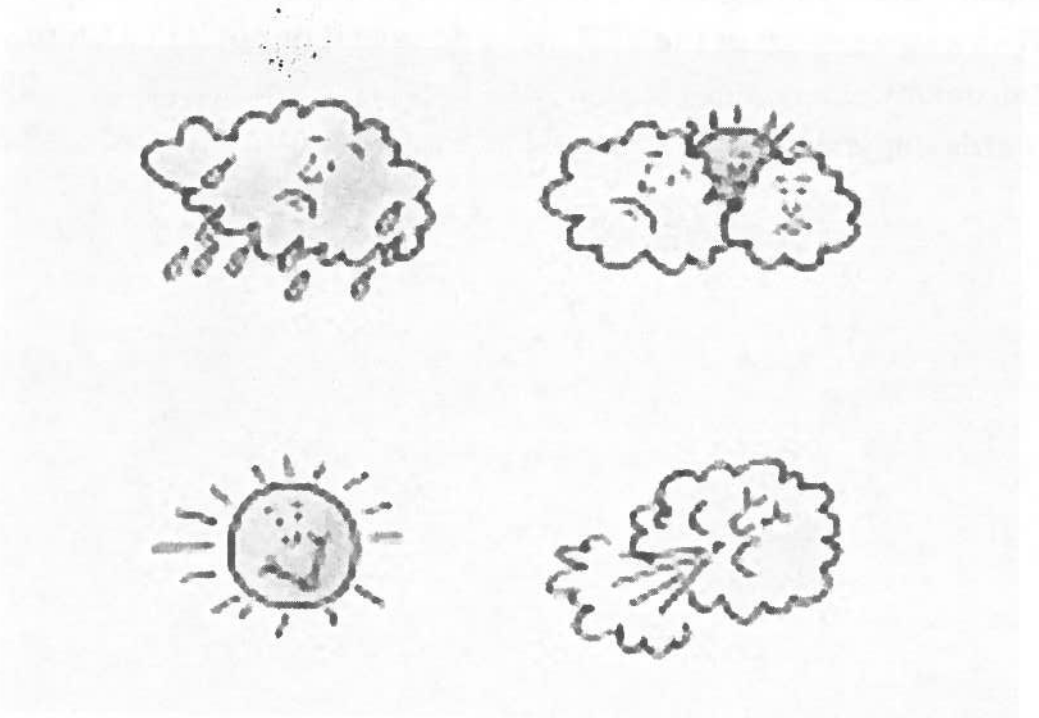
Instruction Manual:
Allen Jordan's Balloon Prediction Program



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1. Introduction

Balloon prediction software is a powerful tool for any individual or program involved with High Altitude Ballooning. The importance of being responsible with the payload and the potential landing locations needs to be considered more frequently nowadays. Safety is vital to both the individuals launching the payload and those who could potentially be affected by the payload (i.e. farmers, pilots, land owners...). Holding the ability to be responsible with the balloons along with tracking and recovering the payloads is priceless. This manual shall explain how to utilize the tools of one specific Balloon Prediction Program created by Allen Jordan.

2. Overview of Allen Jordan's Balloon Prediction Program

Allen Jordan's Balloon Prediction is a valuable tool in the fact that it provides powerful tools that multiple other balloon prediction programs are absent of. For instance the user can enter their program's own sets of descent and ascent rates, whereas other balloon prediction programs typically use one average ascent and descent rate. Additionally, potential for the user to manipulate their ascent rates in order to simulate float is beneficial. Since the algorithm that Allen Jordan's program uses is simply altitude divided by vertical velocity, this yields the time it takes to ascend between each layer.

3. Average Ascent Rates

Note: *These average ascent rates are those used by the BOREALIS program at Montana State University. The numbers were derived from observing multiple flights and averaging the ascent/ descent rates used for each altitude layer. The prediction also is used to manipulate the ascent rate to simulating 1 hour of float. Altitude in meters (m) and Vertical Velocity in meters per second (m/s)*

Altitude (meters)	Vertical Velocity (m/s)
2000	6.1
3000	6.1
4000	6.1
5000	6.1
6000	6.1
7000	6.1
8000	6.1
9000	6.1
10000	6.1
11000	6.1
12000	3.57
13000	3.57
14000	3.57
15000	3.57
16000	3.57
17000	3.57
18000	3.57
19000	3.57
20000	3.57
21000	3.57
22000	3.57
22900	3.57
23580	2.41
25000	2.2
26000	2
26500	1.87
27000	1.73
27500	1.52
27700	1.37

4. Average Descent Rates

Note: *The descent rates recorded below were determined in the same manner as the ascent rates on the previous page. Fall Rates is equivalent to the vertical velocity in the downward direction during descent.*

Altitude (m)	Fall Rate (m/s)
1500	-7.28
2500	-7.39
3500	-8.84
4500	-8.31
5500	-9.48
6500	-8.58
7500	-9.43
8500	-10.21
9500	-10.54
10500	-11.59
11500	-11.19
12500	-12.9
13500	-14.34
14500	-15.17
15500	-16.36
16500	-17.67
17500	-19.5
18500	-20
19500	-22.78
20500	-24.25
21500	-26.25
22500	-28.08
23500	-30.75
24500	-30.33
25500	-32.8
26500	-35.25
27500	-38.25
28500	-41
29500	-43.5

-5 m/s for opened valve.

5. Latitude, Longitude, Elevation Numbers and Sounding Sites

a. Big Timber, Montana

i. Latitude, Longitude, Elevation

Latitude	45.806
Longitude	-109.981
Elevation	1369.162

ii. Sounding Data Site

Great Falls (Montana)

b. Livingston, Montana

i. Latitude, Longitude, Elevation

Latitude	45.699
Longitude	-110.448
Elevation	1420.368

ii. Sounding Data Site

Great Falls (Montana)

c. Harlowton, Montana

i. Latitude, Longitude, Elevation

Latitude	46.449
Longitude	-109.853
Elevation	1313.993

ii. Sounding Data Site

Great Falls (Montana)

d. Bozeman, Montana

i. Latitude, Longitude, Elevation

Latitude	
Longitude	
Elevation	

ii. Sounding Data Site

Great Falls (Montana)

e. Rexburg, Idaho

i. Latitude, Longitude, Elevation

Latitude	43.82
Longitude	-111.80
Elevation	1481

ii. Sounding Data Site

Boise (Idaho)

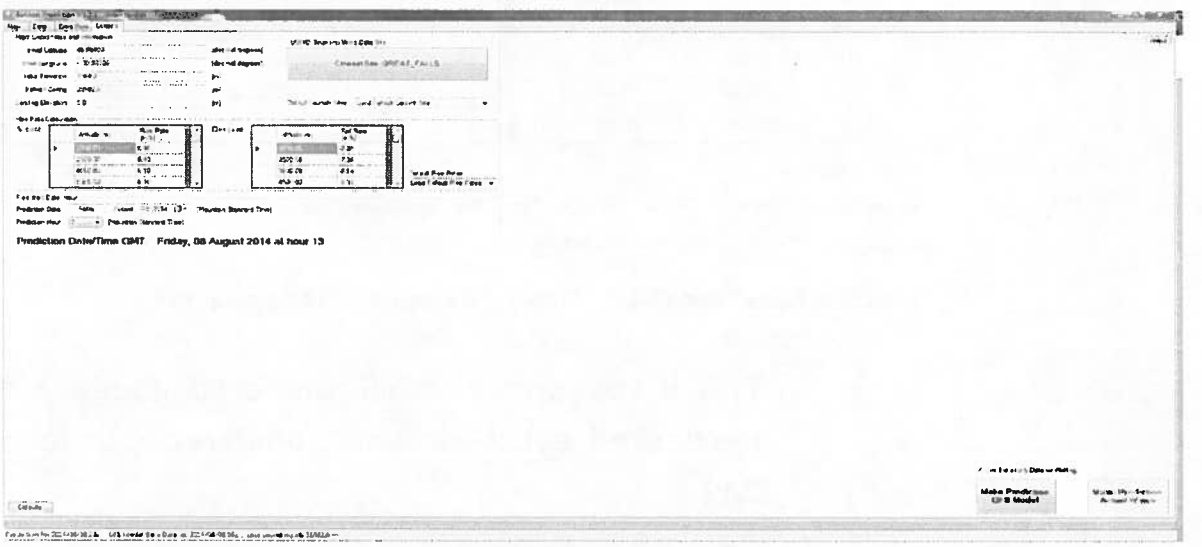
Note: It's okay to use Riverton, Wyoming Sounding site for predictions because Rexburg (RXE) has its own predictions

6. How to run the program

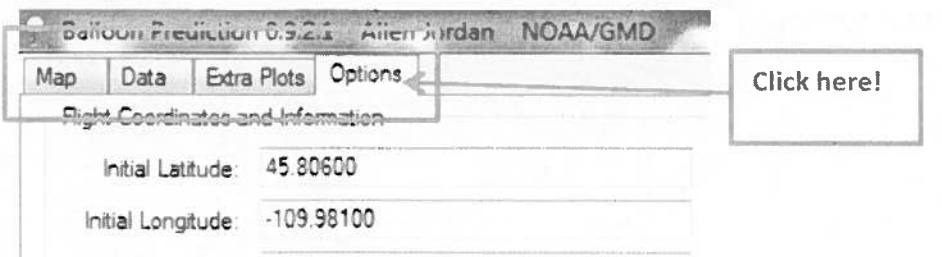
a. Open Balloon Prediction 0.9.2.1 Program

i. Double- Click on the Balloon Prediction Program Icon (seen in the figure below); typically a short cut to the program is located on the user's desktop

b. Making sure you start in the right window after the program opens

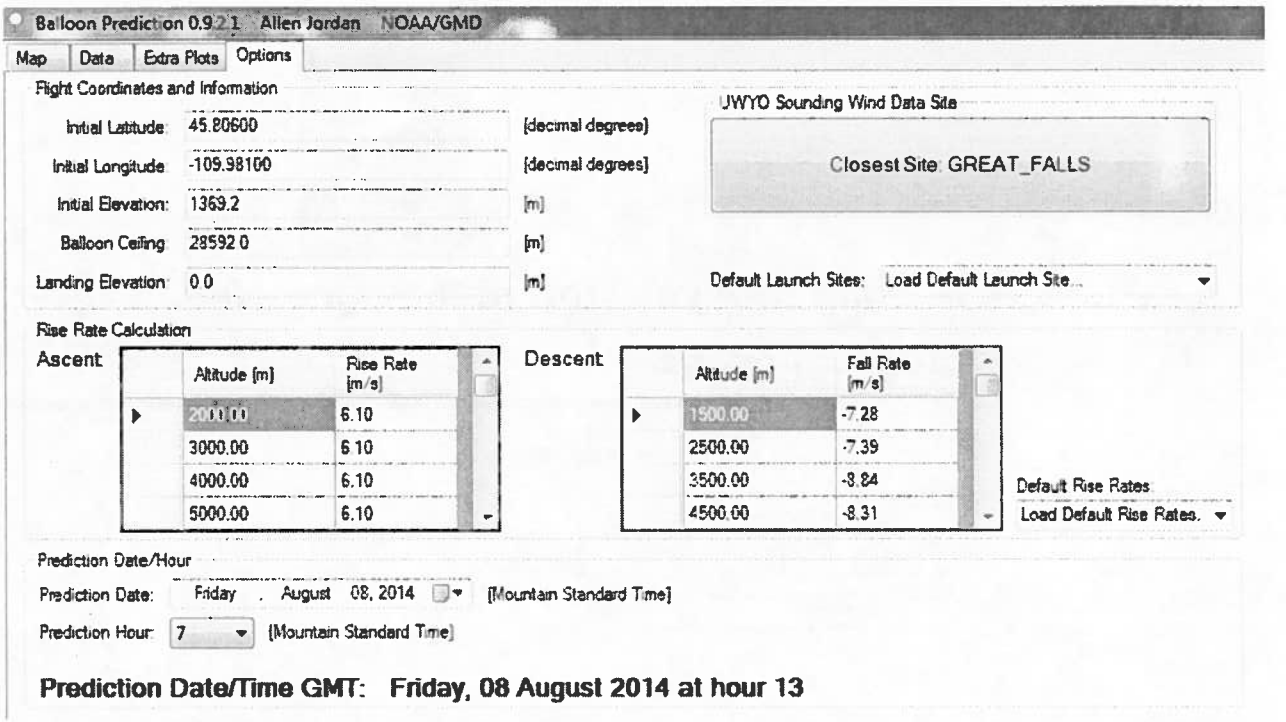


i. **Note:** Sometimes the program will open into one of the other tabs if that is the tab it was closed in. If that happens go to the top of the program window where the 4 tab options are located

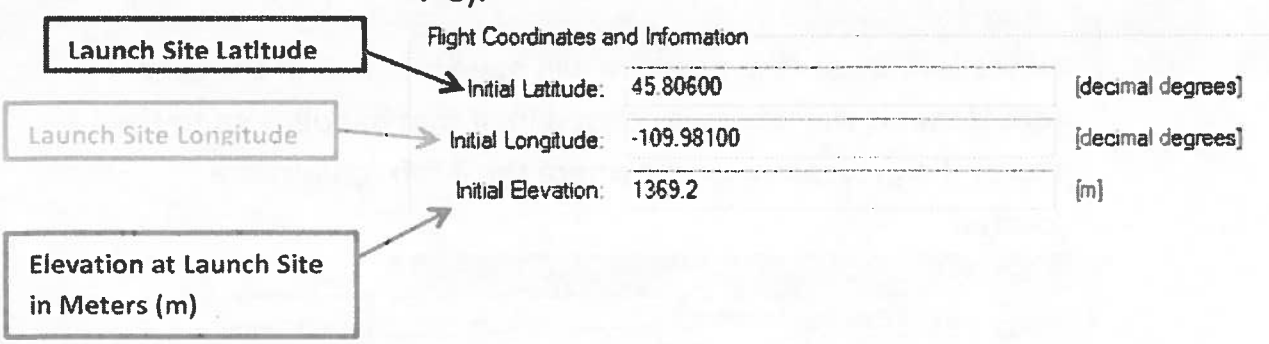


ii. Click on the options tab to bring up the main window

c. Filling in the correct information under the options tab



i. Type in the correct initial Latitude, Longitude, and Elevation of the desired launch location (numbers can be found on pages 7-8).



ii. Balloon Ceiling

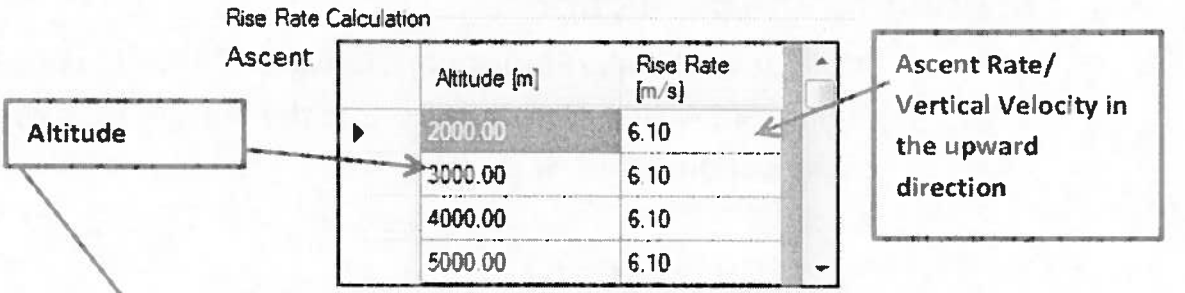
1. Our program uses 28592.0 meters. This number is the predicted burst altitude.

iii. Landing Elevation

1. Use either 0 meters or the starting elevation because in Montana it changes so much depending on the landing locations

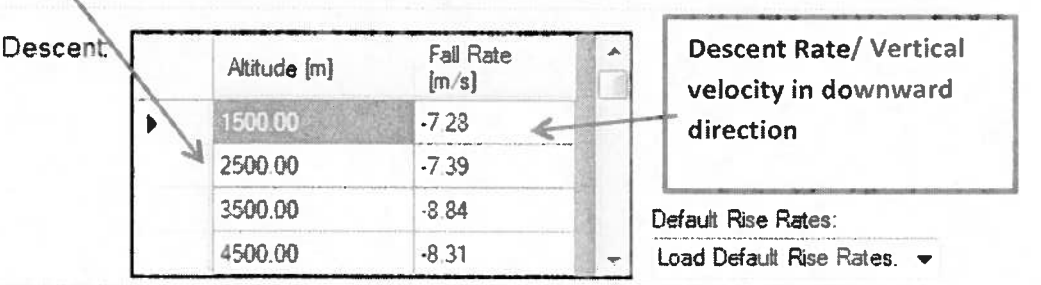
iv. Ascent Numbers

1. Type in the values from Part 3



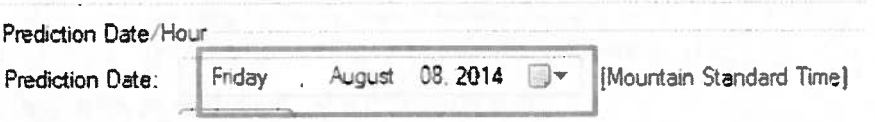
v. Descent Numbers

1. Type in the values from Part 4 here. Do **NOT** use the default rise rates or other options; those values are based on a different size payload and Boulder, Colorado



vi. Prediction Date

1. Choose the date desired; remember, the date will affect the prediction if future prediction data, previous prediction data, or historic real wind data is used
2. Make sure for future prediction to have the correct year

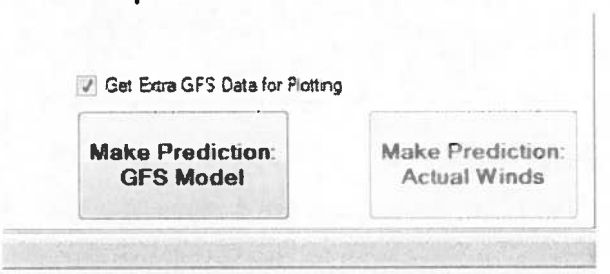


vii. Prediction Hour

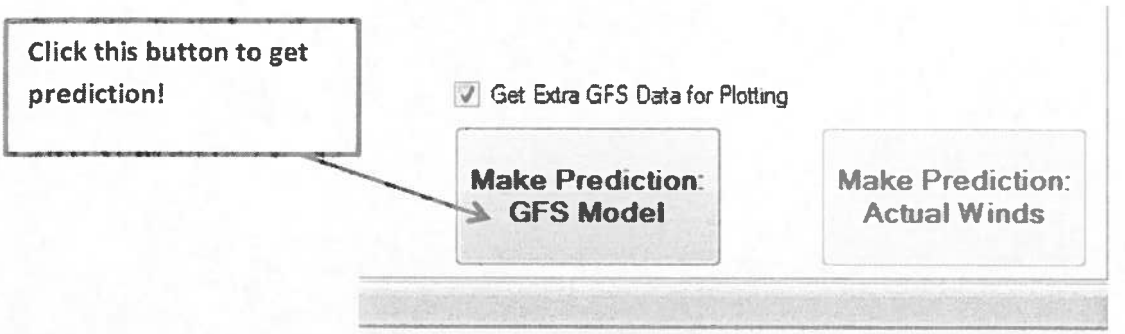
1. Talk to the flight director about the time desired to launch for predictions, or the time of day one needs to analyze. Typically, it will be set to 7 MST as show below.

d. Running the prediction

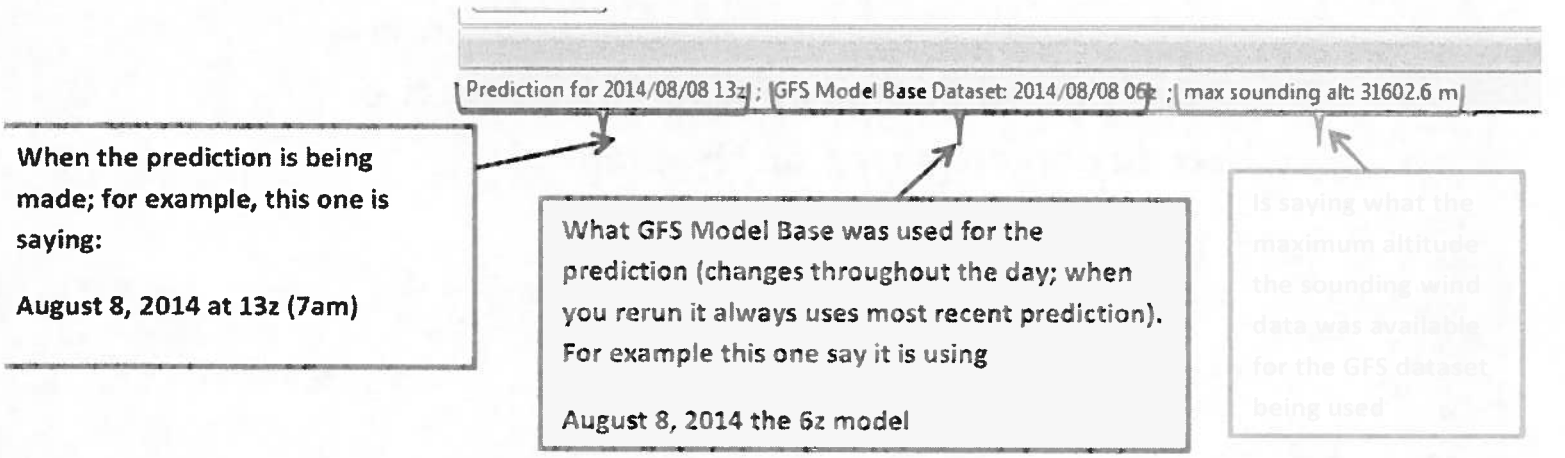
i. Look for the "Make Prediction: GFS Model" and "Make Prediction: Actual Winds" buttons in the bottom right corner of the options window



ii. If making a future balloon prediction click on the "Make Prediction: GFS Model" tab. Note: keep the "Get Extra GFS Data for Plotting" box checked; it brings in extra information that might be useful



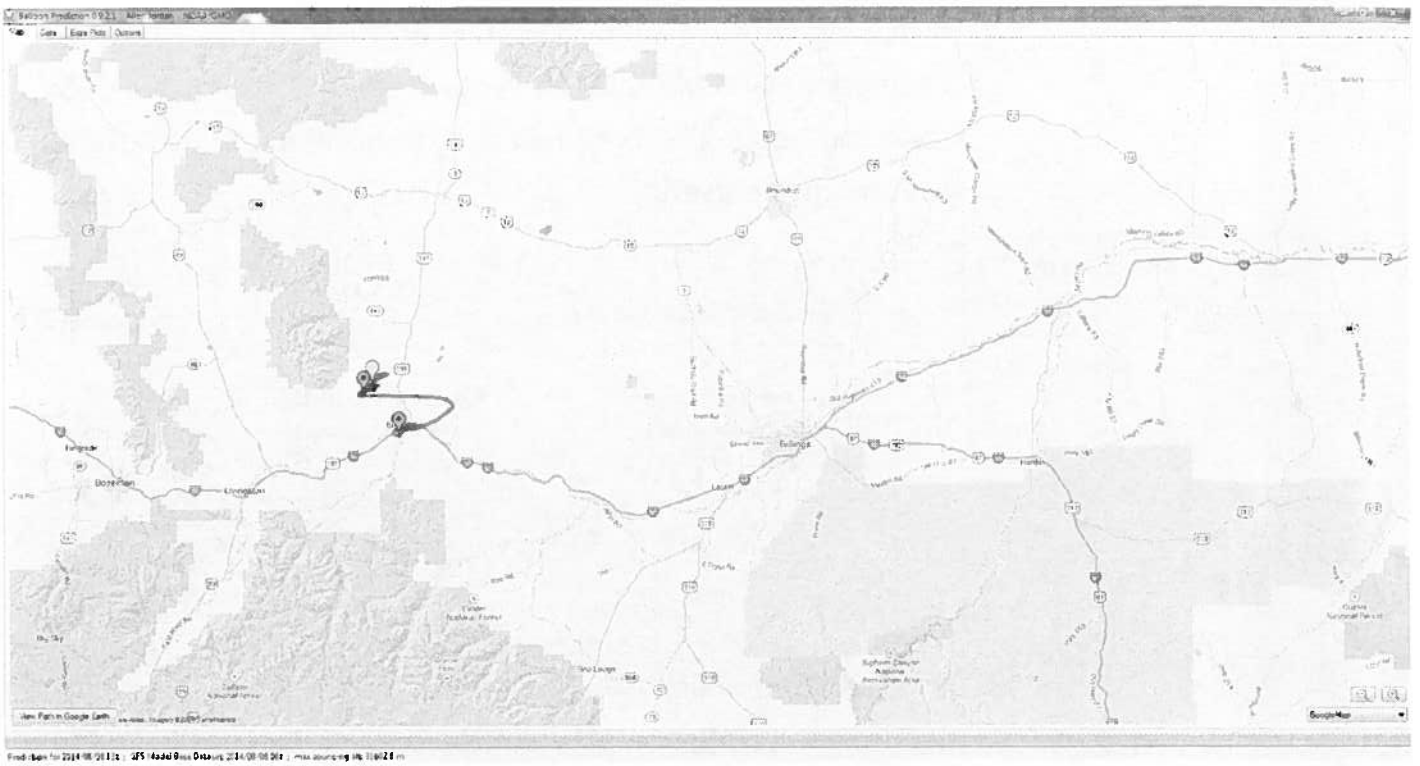
iii. User can find which GFS model (0z, 6z, 12z, or 18z) is being used when prediction is run in the bottom left of the window in all 4 of the tabs



iv. Brings the user automatically to the Map tab

e. Result from running the prediction

i. The Red line is the Ascent Path
ii. The Purple Line is the Descent Path
iii. The Green Balloon Icon is the predicted landing point

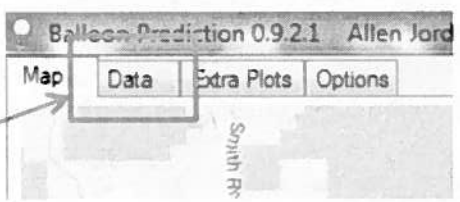


iv. If want to save this profile simply use the Snipping Tool on the computer and put into a Microsoft Word document

f. Acquiring additional information about the prediction displayed on the map

i. User can click on the data tab

Click this tab to obtain extra data about predicted flight path



1. This will result in the following information

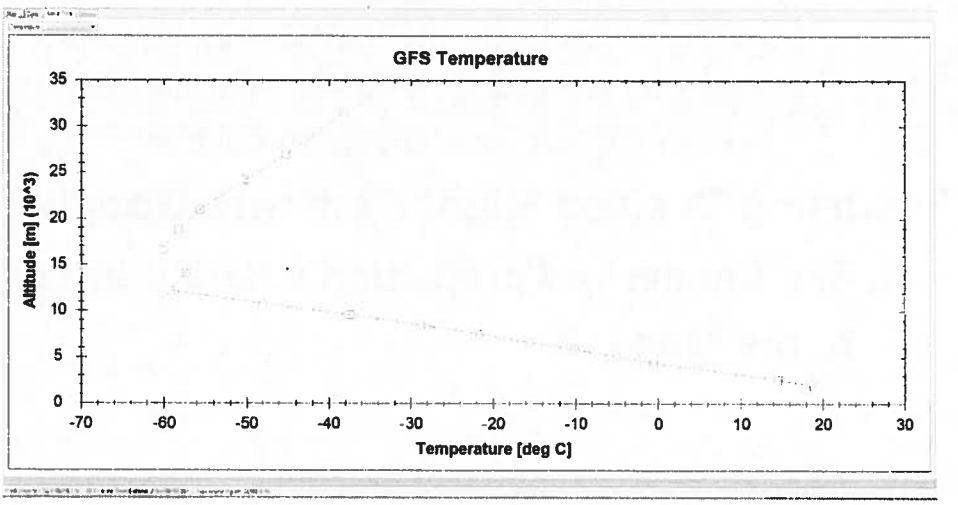
This is talking about the predicted landing point. The latitude and longitude at that point and how far away the balloon traveled from the launch point are listed.

```
Impact Point
          latitude:       45.94232
         longitude:     -110.08123
     distance away:          17.03 [km] ( 10.58 [miles] )
Burst/Turn Point
          latitude:       45.91251
         longitude:     -110.11388
     distance away:          15.69 [km] ( 9.75 [miles] )
```

Information about the predicted burst point including the latitude, longitude and distance it will be away from the launch point

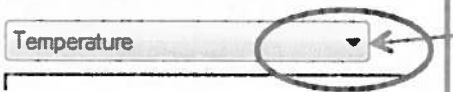
ii. User can click on the Extra Plots tab

1. Which will result in the following window



Displayed is the temperature versus altitude reading using the GFS model

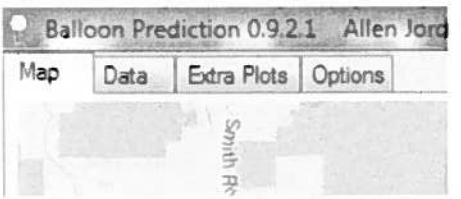
2. If you look at the top left corner of the window the user will find a pull down tab.



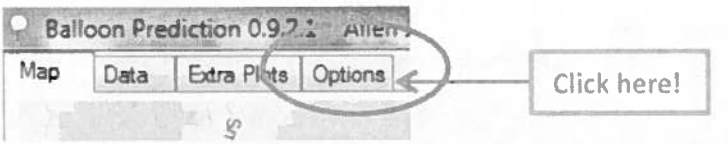
If the user clicks here two other options (Humidity and Ozone) for which charts will appear. The user can choose from these as well

g. Running more predictions after the initial prediction

i. Go to the top left of the program window where user will find the four tab choices in the same manner as below



ii. Click on the options tab

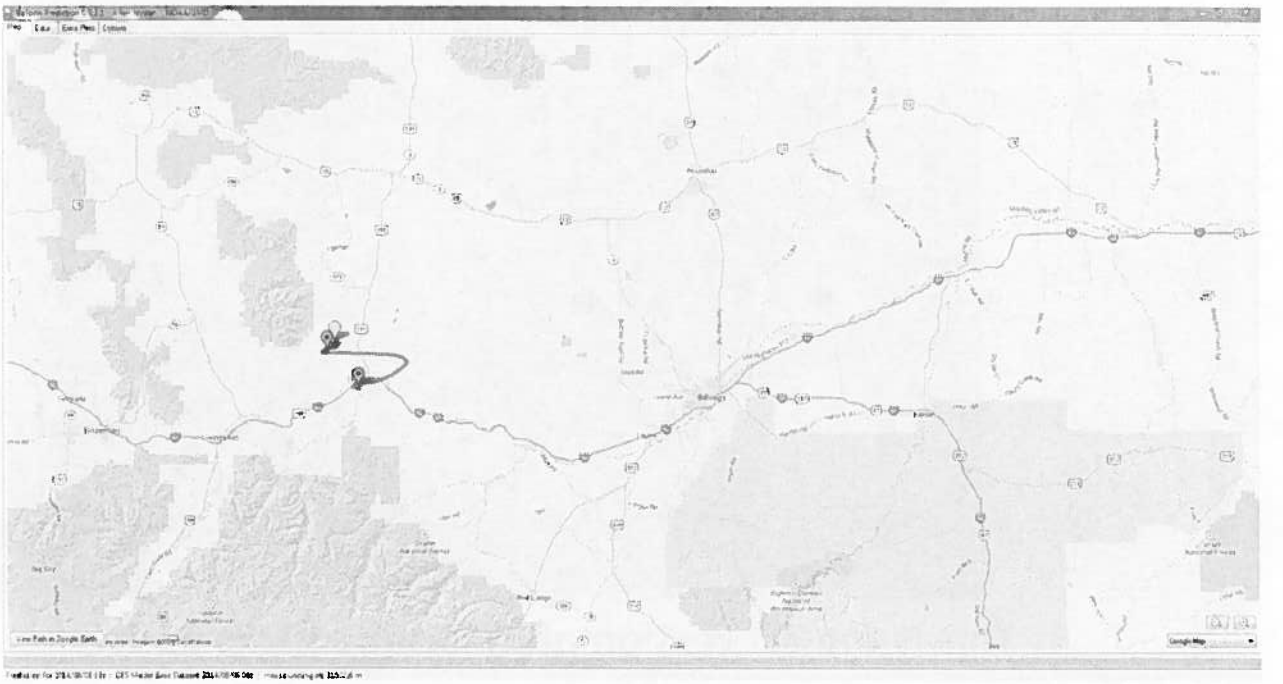


iii. This will return the user to the original starting window where the user can change whatever information they need to by repeating Part Six, steps "a" through "e".

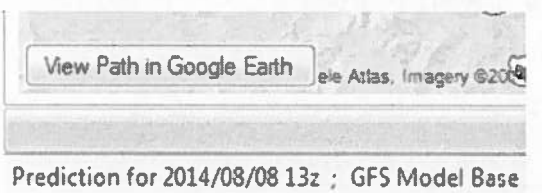
7. Exporting Desired Flight Path into Google Earth

a. Run the desired prediction where it brings the user to the Map tab

b. Once under the map tab the user's screen should appear similar to:



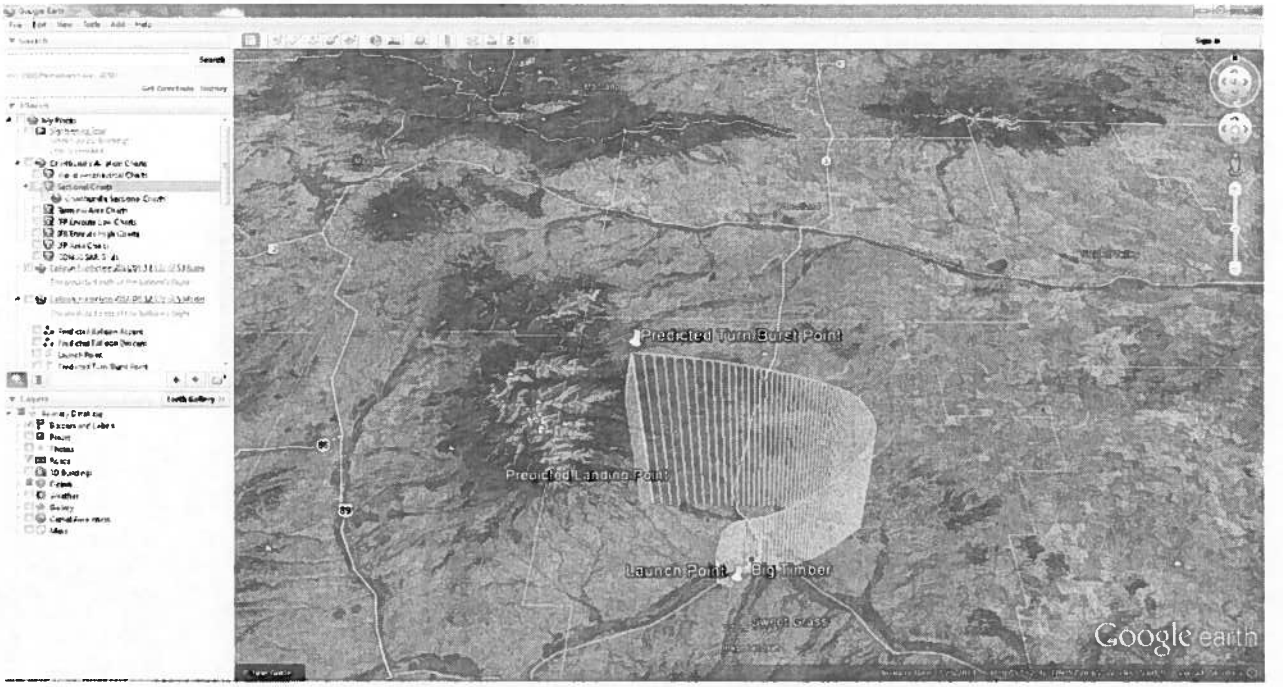
i. Go to the bottom left corner of the screen where the user will find a View Path in Google Earth button



ii. Click this Button

iii. This button, once clicked, automatically connects the user to Google Earth (if downloaded on the computer)

iv. The map will appear similar to as follows



c. This is the 3D version of the user's flight path

8. Utilizing VOR Map Utility in Google Earth

a. In the case of filing NOTAMs, the user must download Chartbundle Aviation Charts if they haven't already

i. Go to http://www.chartbundle.com/charts/

ii. Scroll to the bottom of the webpage where the user can find the KML/KMZ (Google Earth) option

KML/KMZ(Google Earth)

You can download the KML file for all our charts here(expand it and check the boxes as needed):chartbundle_aero.kml

Gridded Charts

Both our on-line viewer and the MOBAC OruxMaps Locus configurations include options to enable a Sectional, Terminal Area or World Aeronautical Chart with a CAP SAR Gri displays you need to zoom in a fair bit before the grids and labels become visible. Only Continental US at this time.

Disclaimer

These products are derived from official FAA data but are not themselves official navigation products. Use of these products is at users own risk. All charts have been reprojected,

Contact us at: charts@chartbundle.com with any questions.
Our goal is to provide web access to raster charts. If you're looking to purchase paper copies we suggest: Aircraft Service or Pilot Mall.com

iii. Click on the link, download it, and then save it into MyPlaces in Google Earth

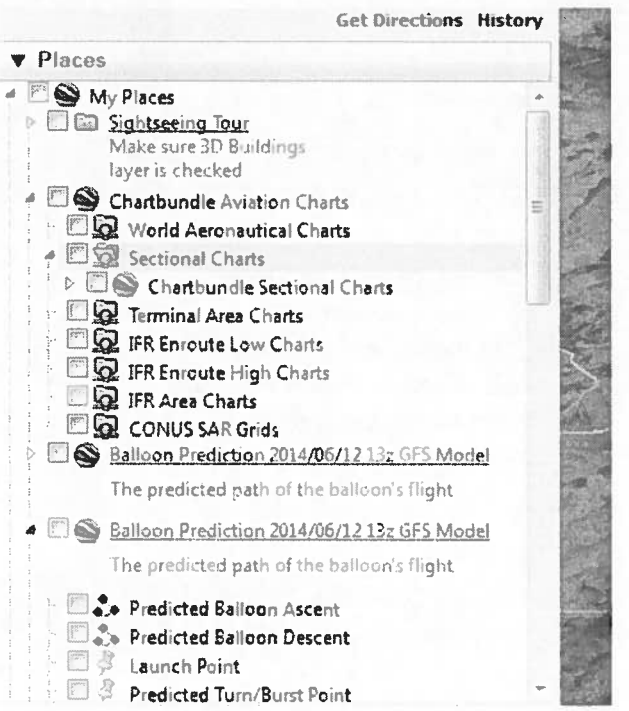
KML/KMZ(Google Earth)

You can download the KML file for all our charts here(expand it and check the boxes as needed):chartbundle_aero.kml

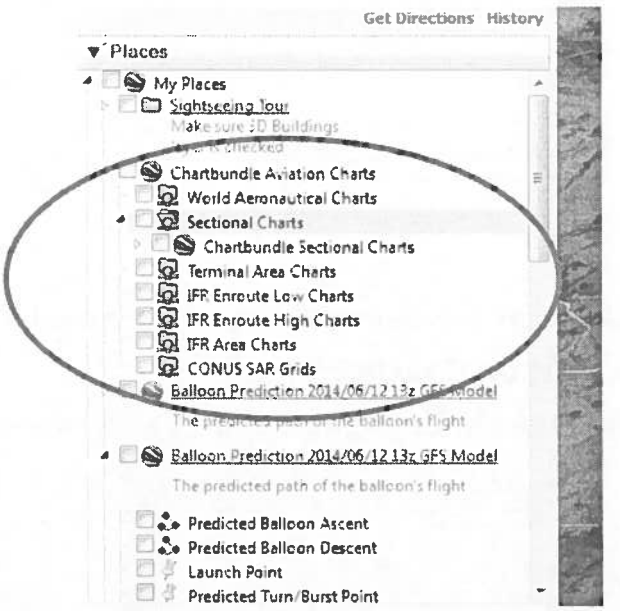
Click and download this!!!!!

b. If the user already has this saved in their MyPlaces but the Sectional Map isn't appearing on Google Earth, then

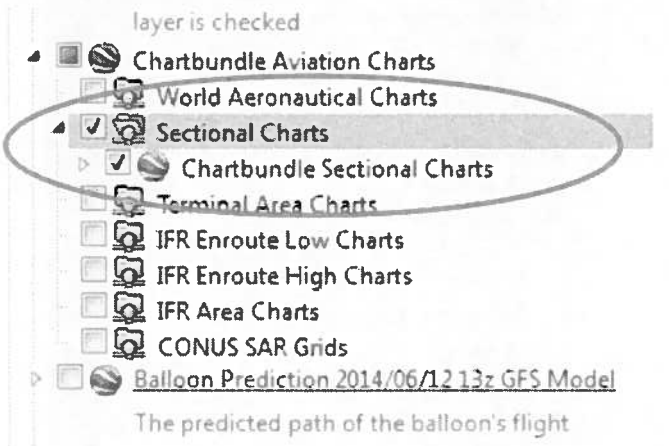
i. Go to the far left side of the Google Earth window



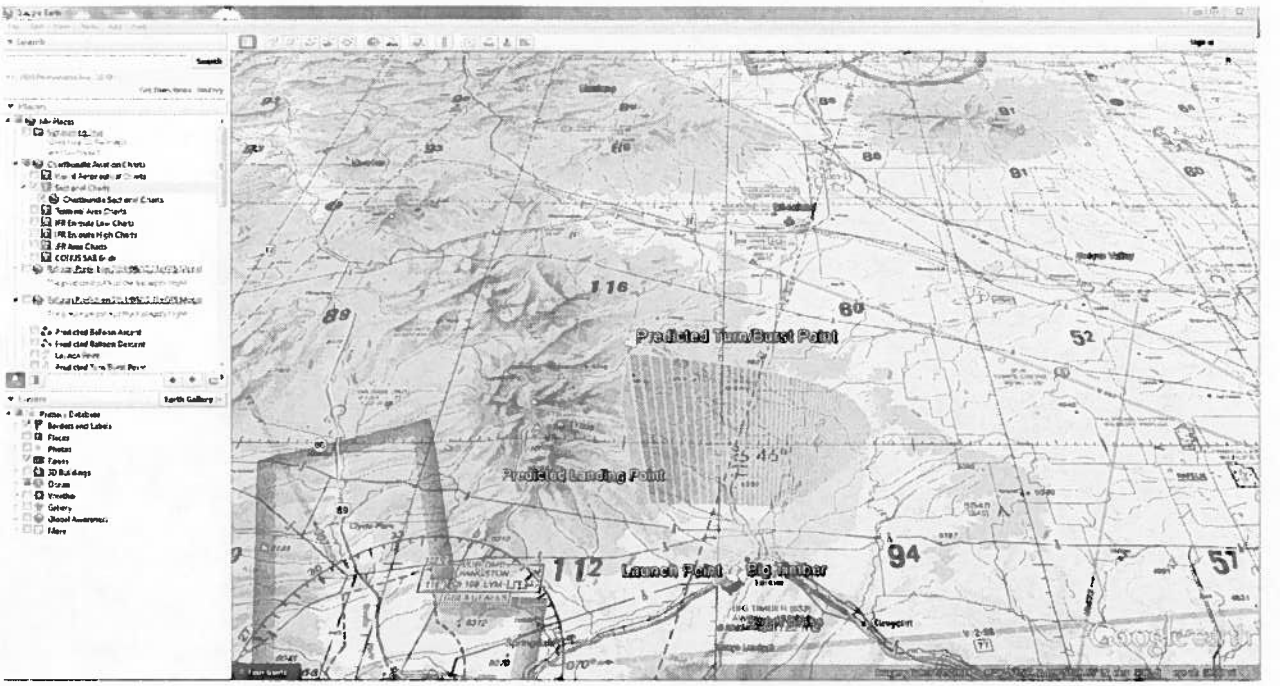
ii. The user will see the Chartbundle Aviation Charts



iii. Make sure the Sectional Charts Box is checked!



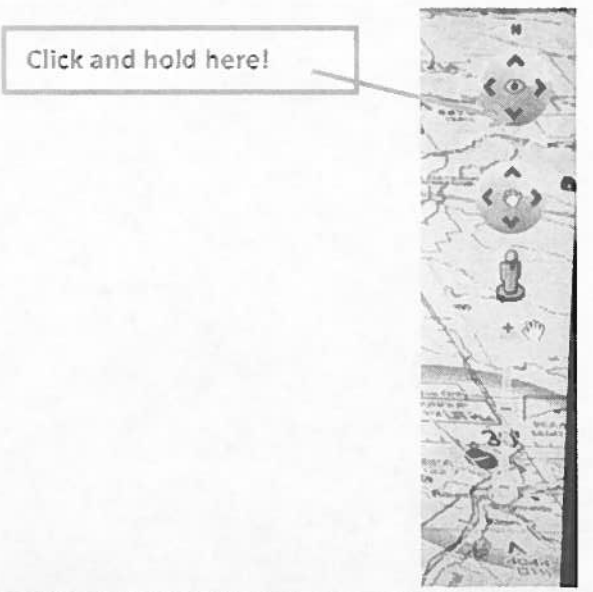
iv. Now the user's screen should appear as follows

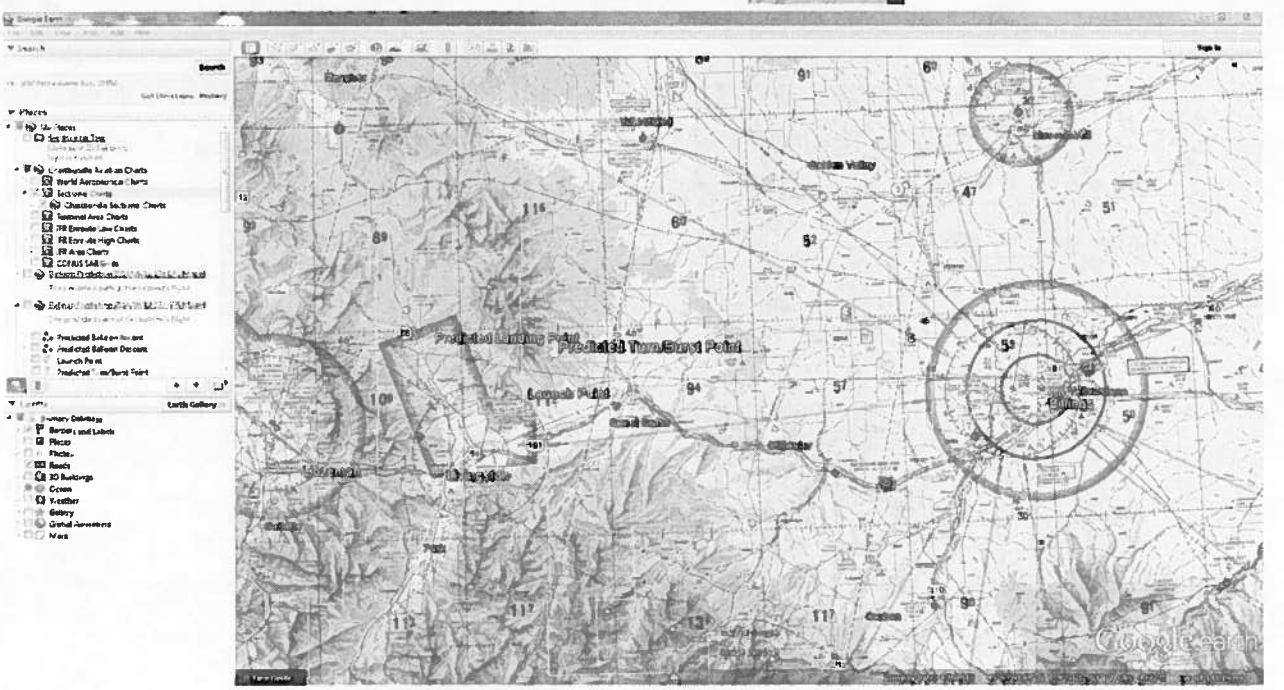


C. From here begin preparing the VOR map for the NOTAM

i. Go to the top right side of the screen in Google Earth where the user can find tools for orienting the map

1. *Click the bottom of the top circle and hold until the map flattens as follows*

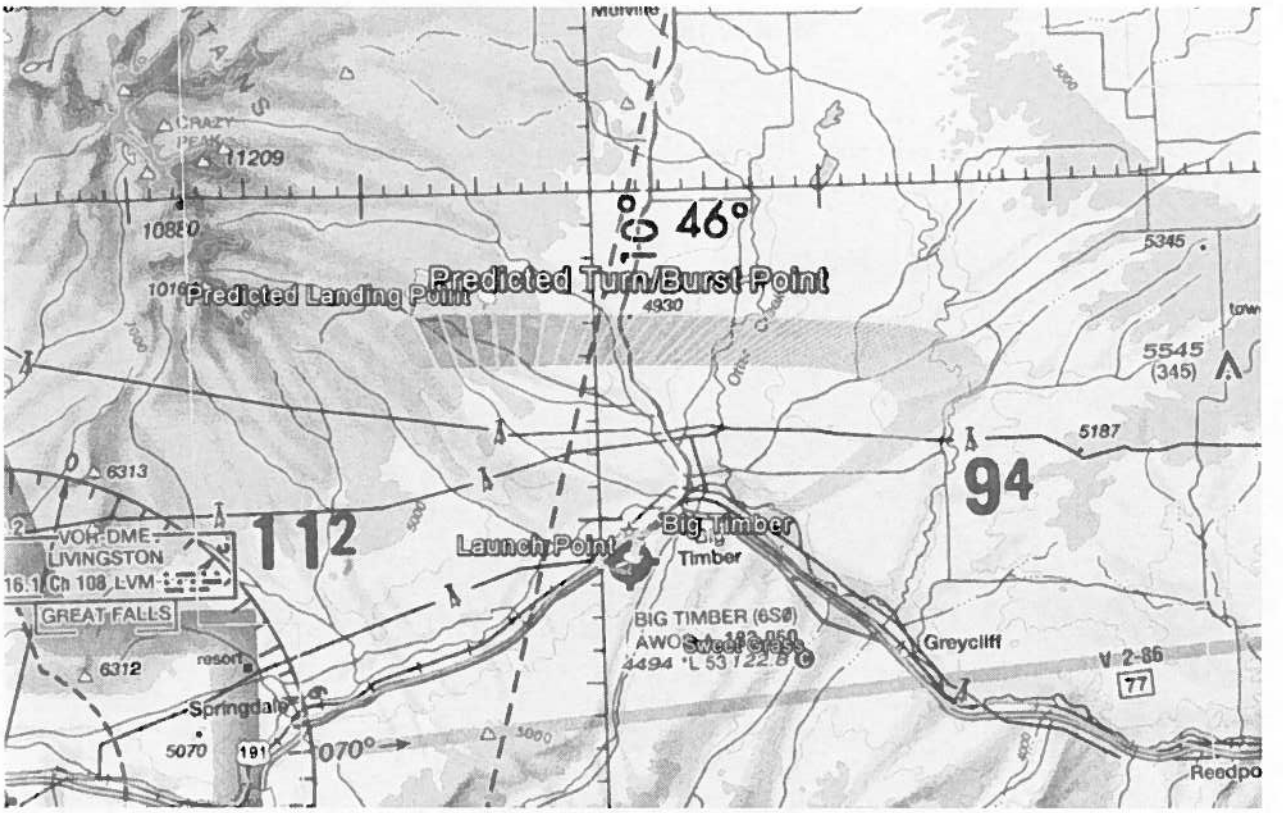




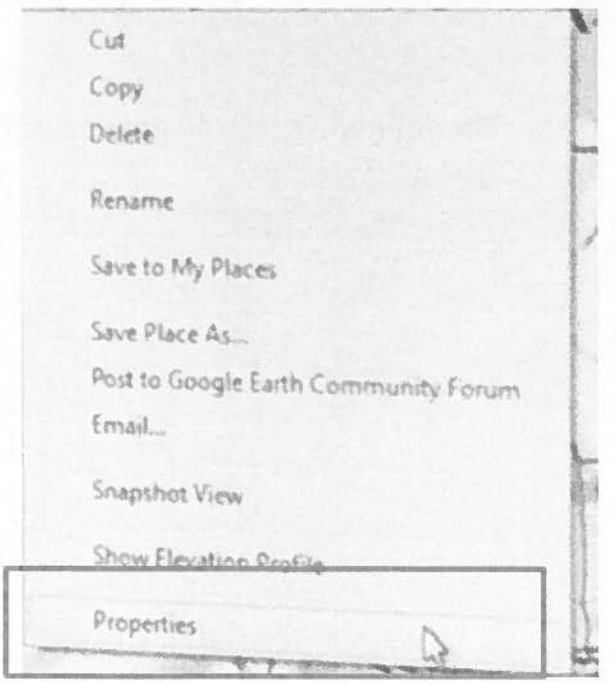
2. *Make sure the N on top of the circle is faced upward*

ii. Now the user can make the flight path more visible by following the next steps

1. **Zoom in to the flight path**

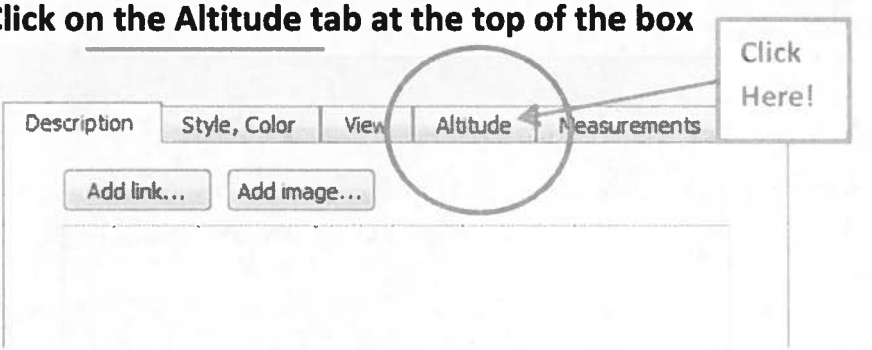


2. **Right click on the teal/ light blue path**



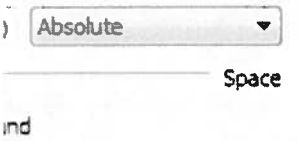
3. **Choose the Properties option**
    a. A window as follow should pop up

4. **Click on the Altitude tab at the top of the box**

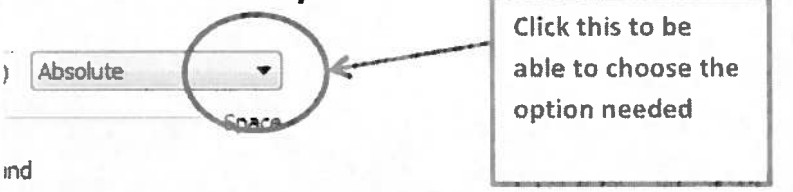


5. **The following should appear when Altitude tab is chosen**

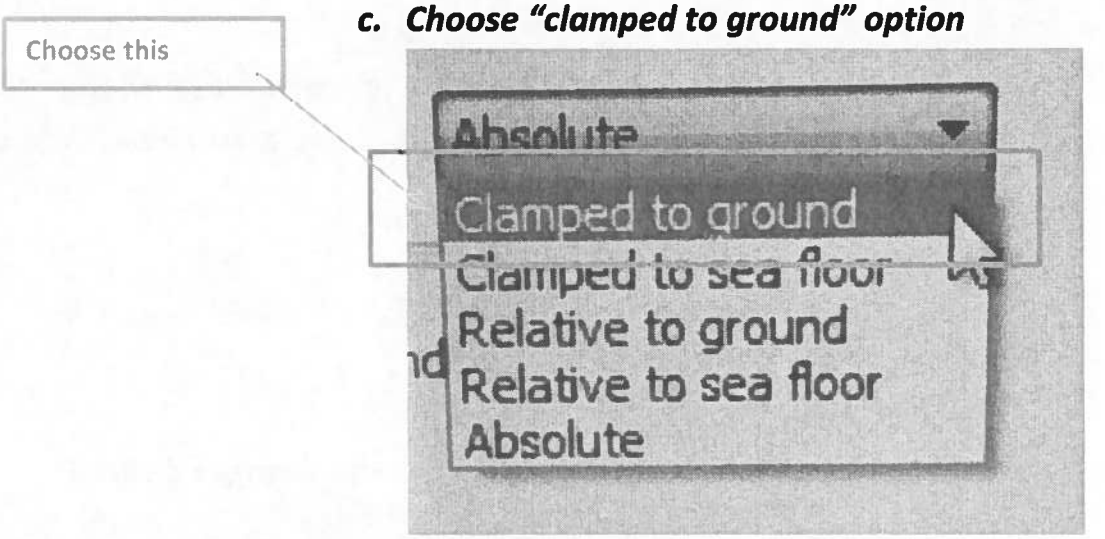
a. Go to the scroll down tab on right side of box



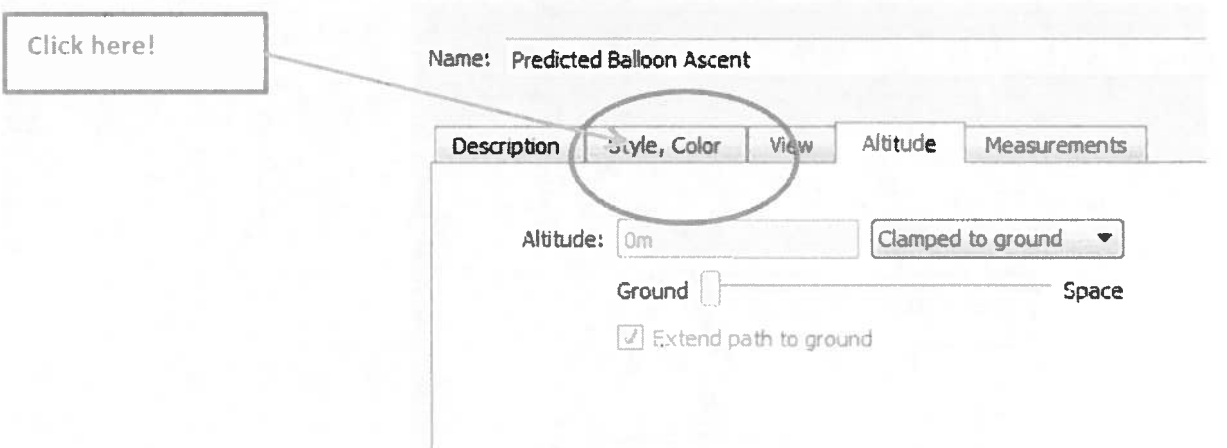
b. Click to see other options



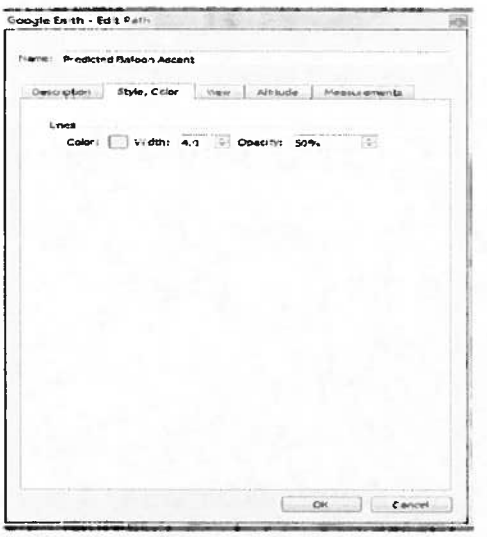
c. Choose "clamped to ground" option



6. Now click on the Style, Color Tab

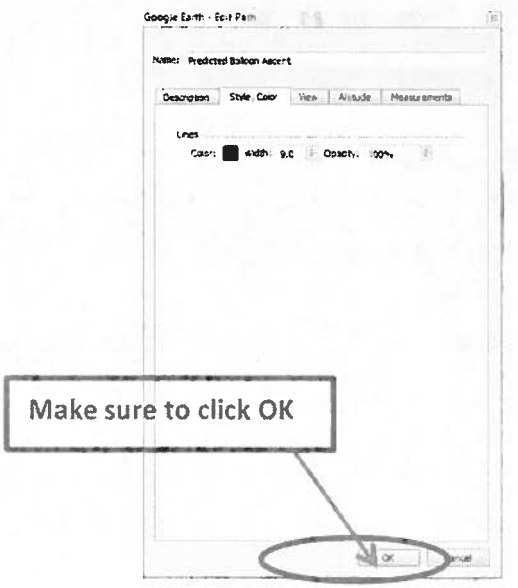


7. **The following should appear when the Style, Color Tab is chosen**



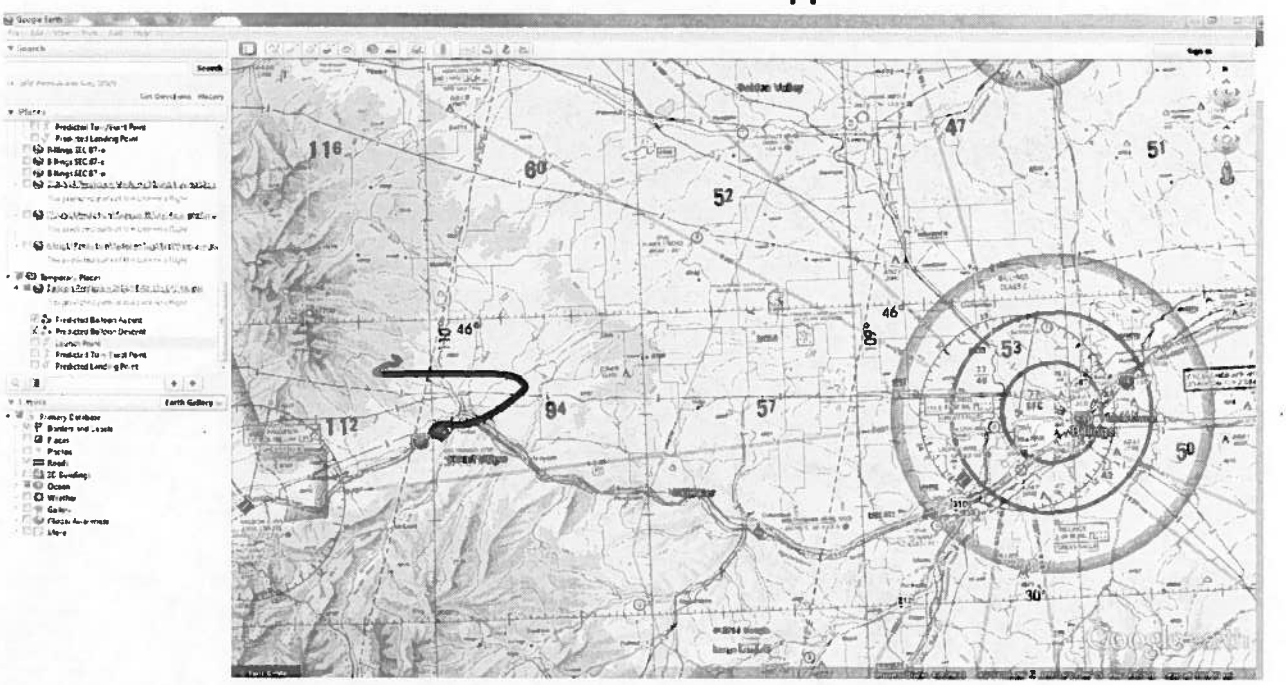
   a. ***Click on the color and select black, change the width to 9.0 and the Opacity to 100%. Should look as followed***

8. **Now press OK to select all the changes desired**



9. **Repeat for the descent portion of the flight path (green) but change the color of the line to red; the Style, Color Tab should appear as follows**

10. **The user's screen should now appear as followed**

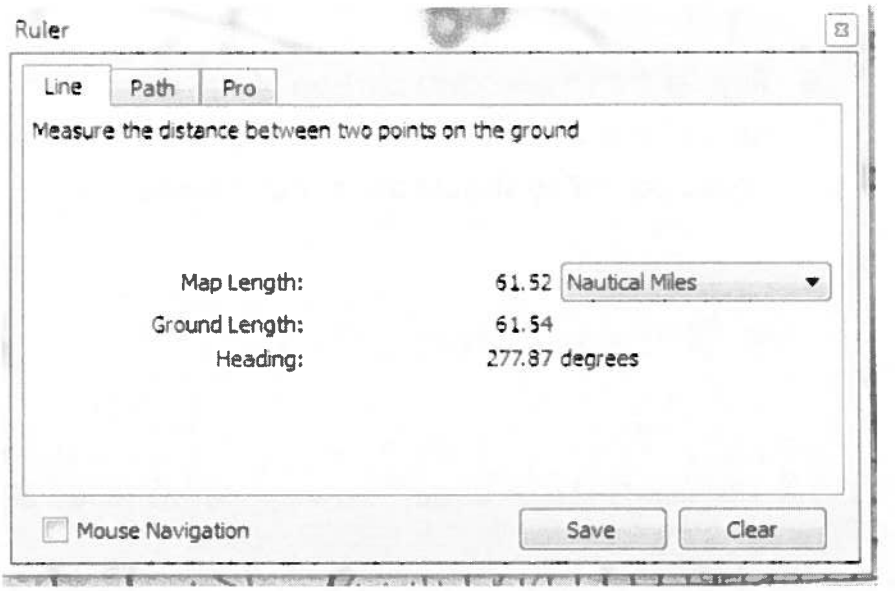


9. Finding the distance from the Billings VOR site

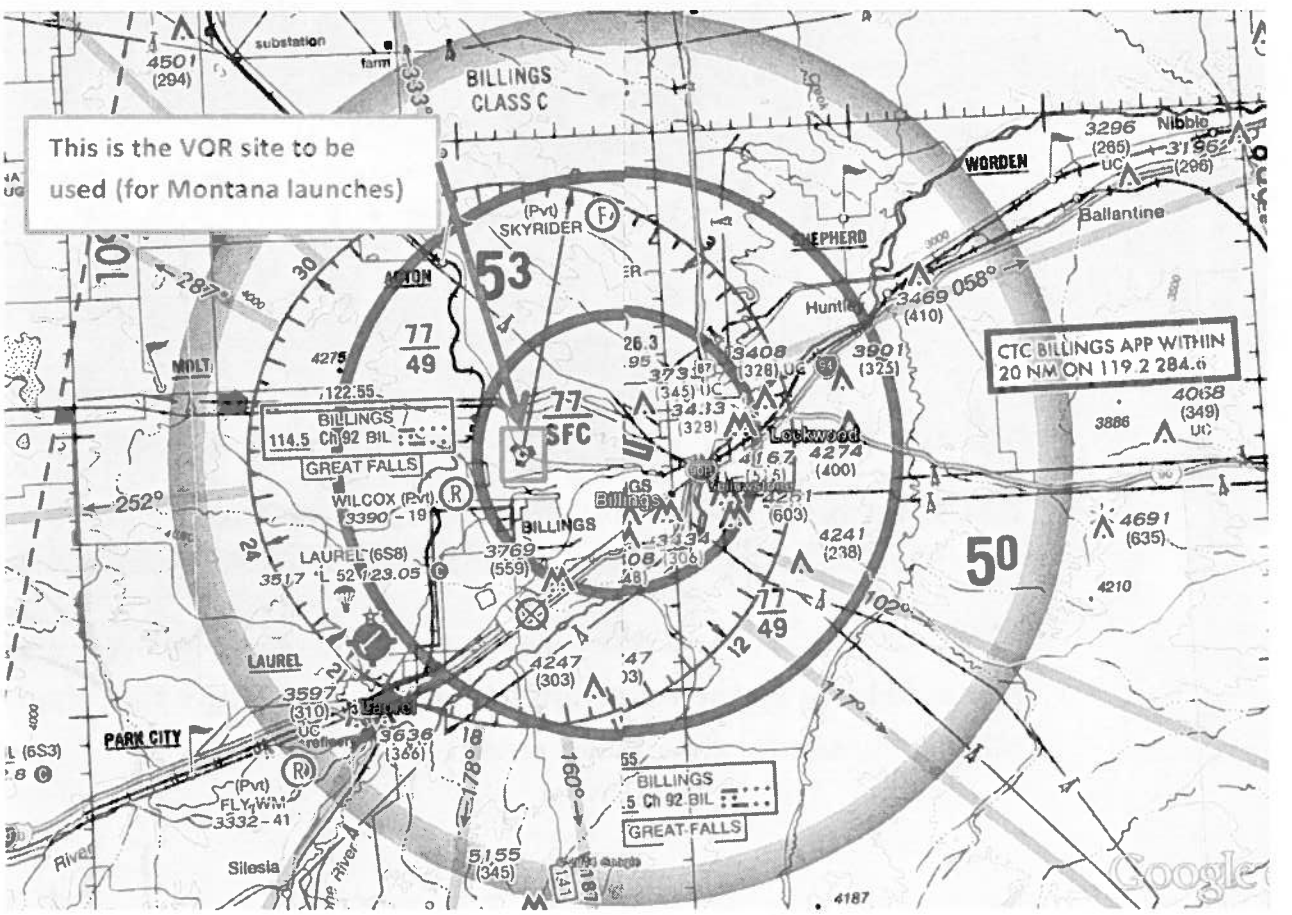
a. Use the measure tool found at the top of the screen

Click Here

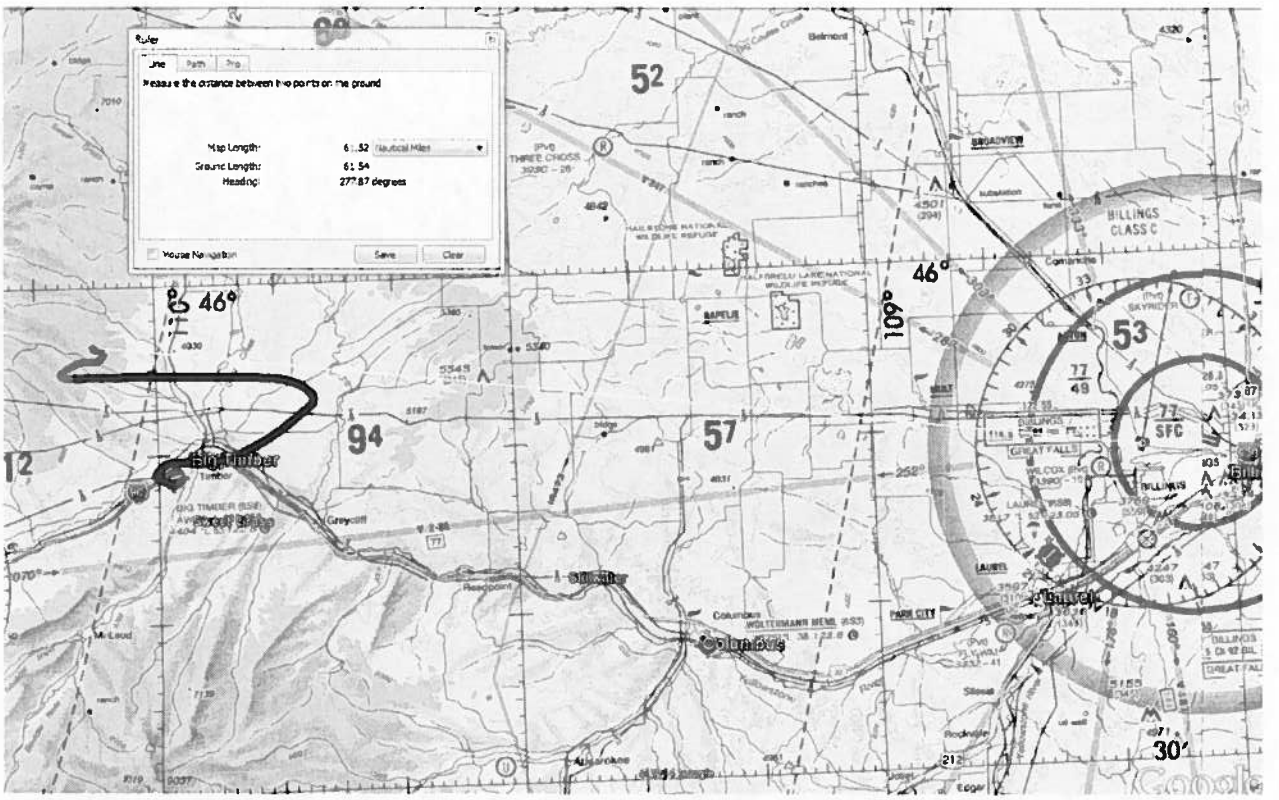
1. **It should bring up the following option box; make sure that Nautical Miles is chosen for the measurement to use**



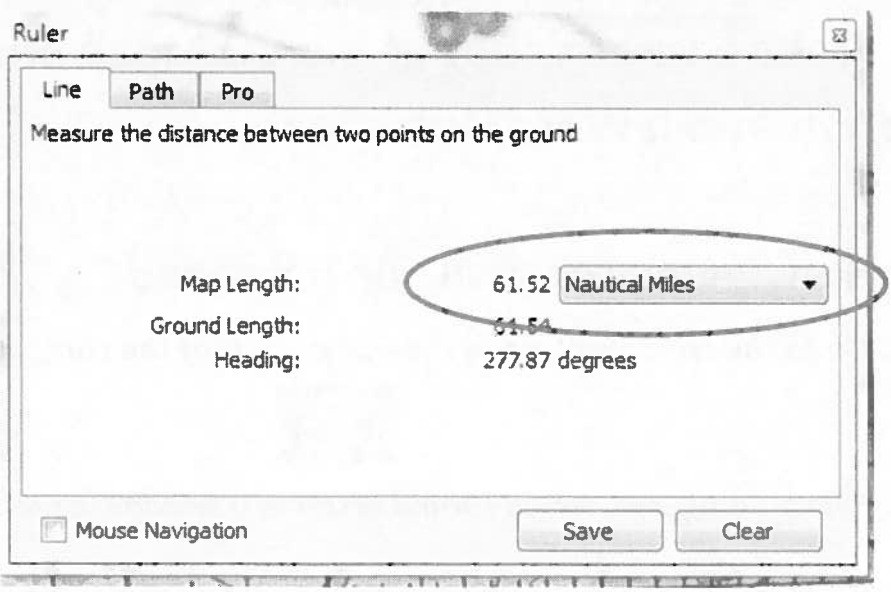
2. **Then go from the predicted landing point to the VOR site (example below)**
    a. ***Below is the Billings VOR circle and the VOR site to be used is marked***



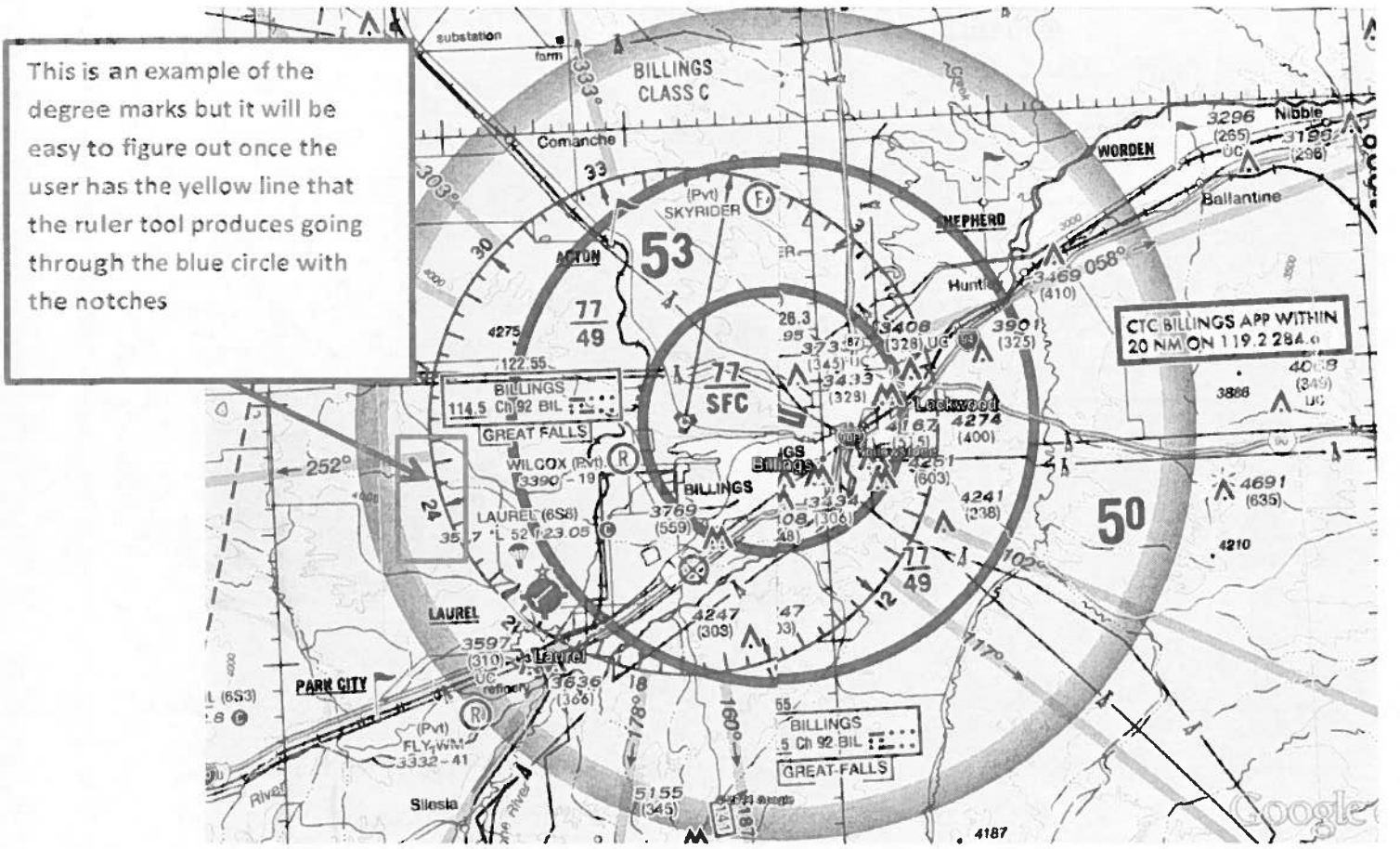
b. The user needs to use the ruler tool to go from the Billings VOR site to the predicted landing point which will produce a figure similar to as follows



c. Report the distance in Nautical miles that appears



d. Also report the degree mark that the predicted landing point is from the VOR site

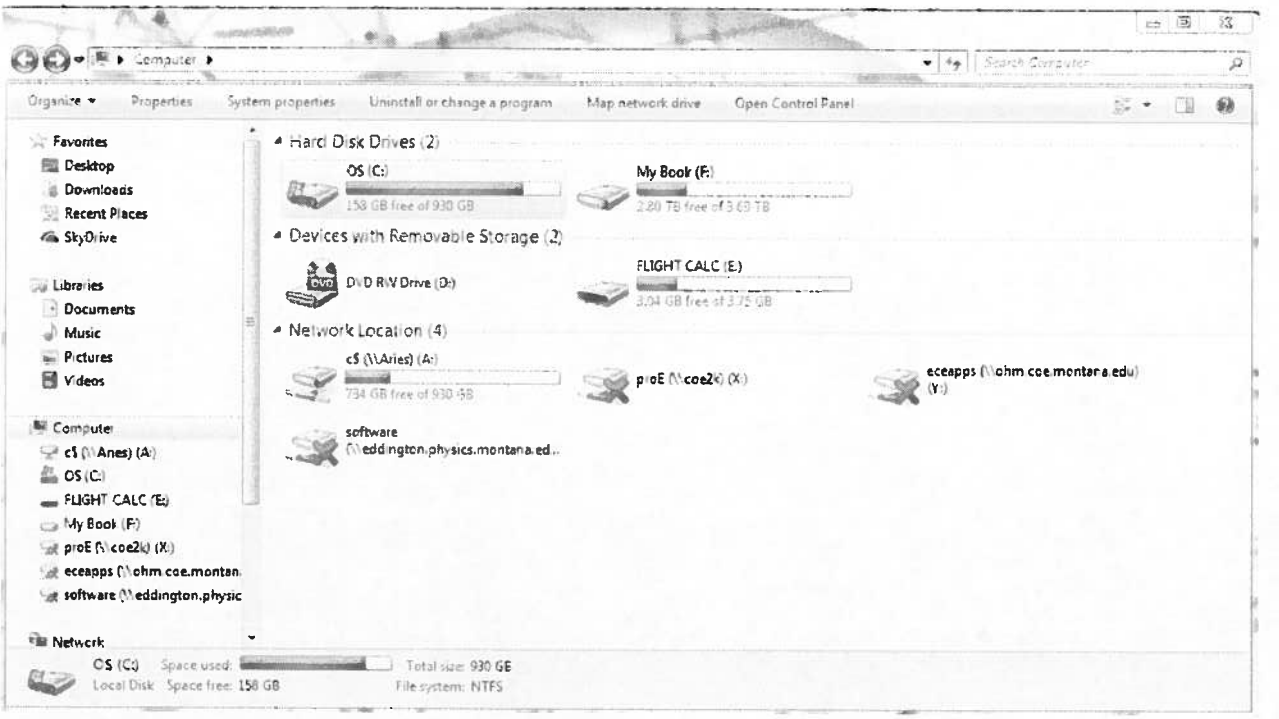


10. Take a screen shot of the VOR map and save it or put it into a Word Document

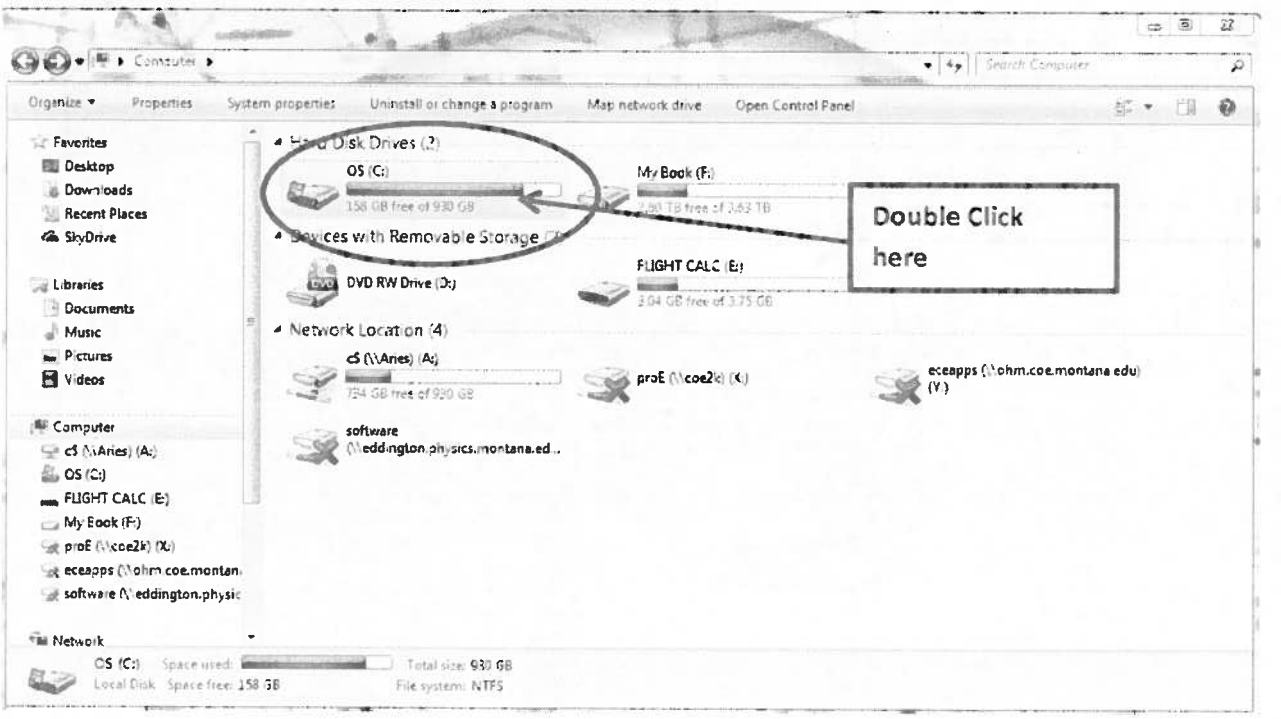
11. Retrieving the KML file if needed

a. Go to the windows Icon in the bottom left of the computer screen

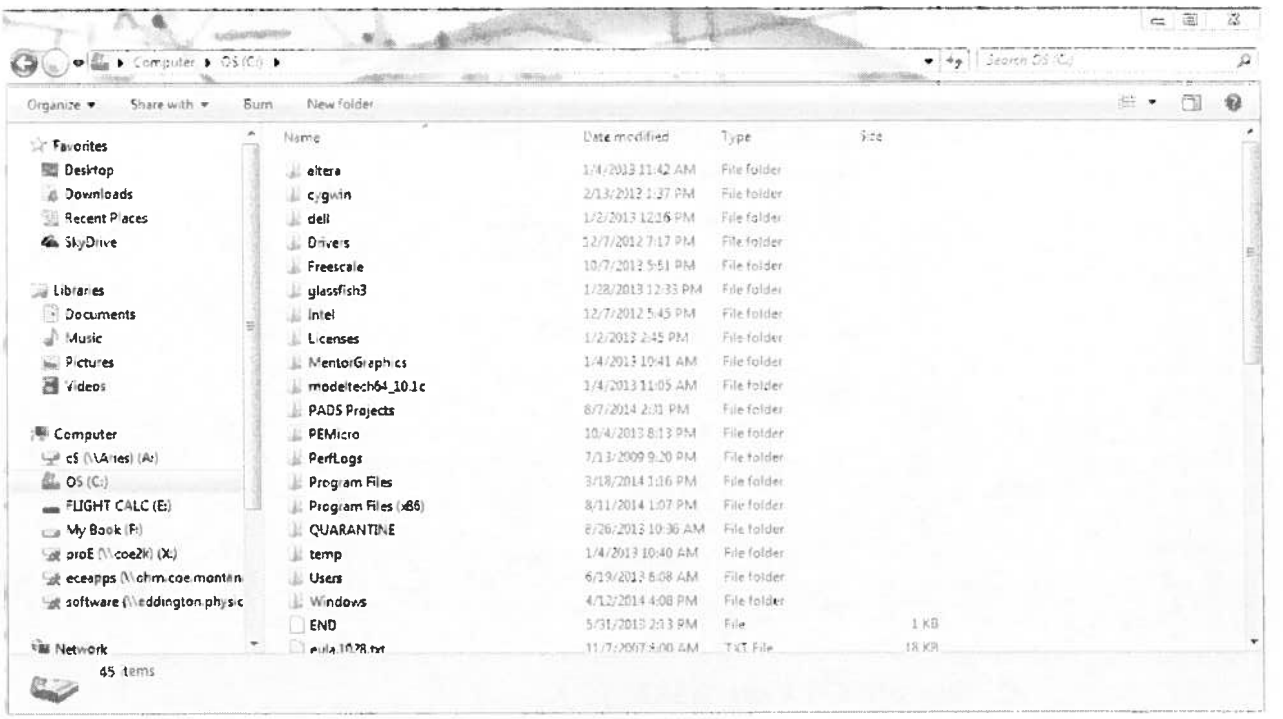
b. Select Computer, which should result in a window as follows



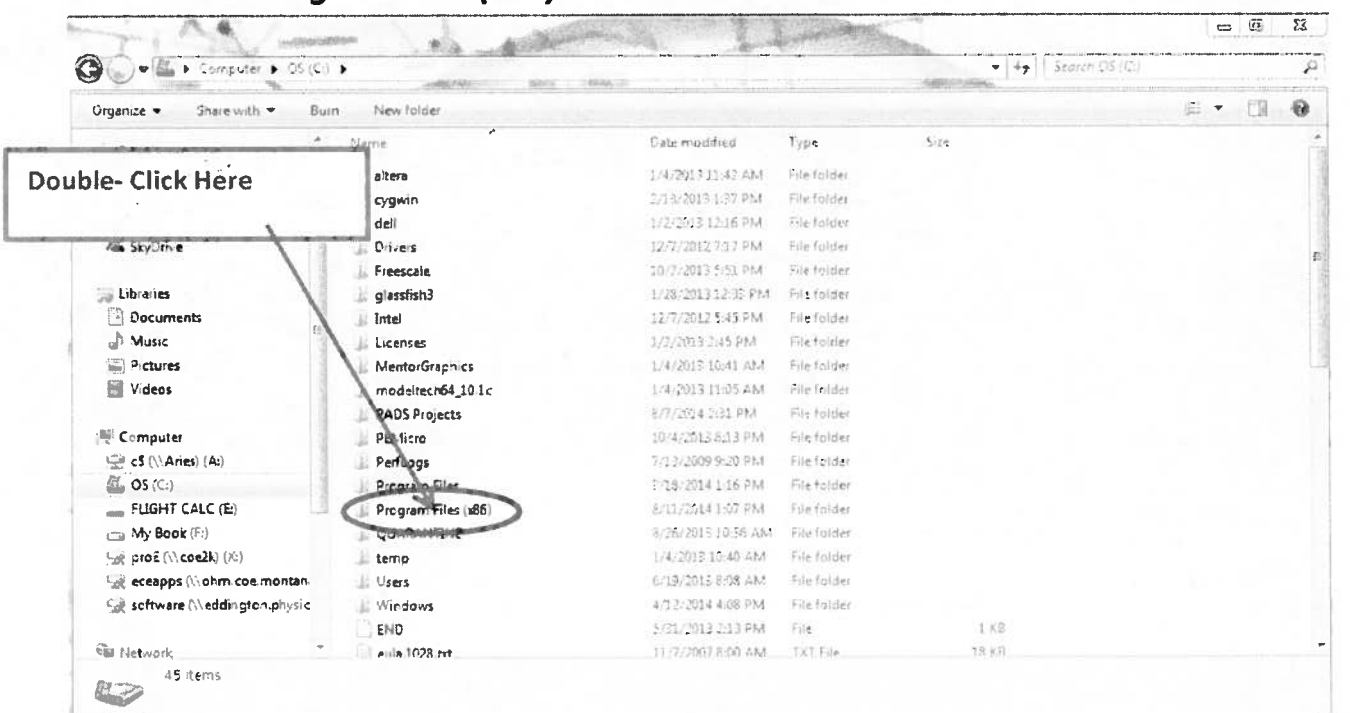
C. Double Click on the OS (C:)



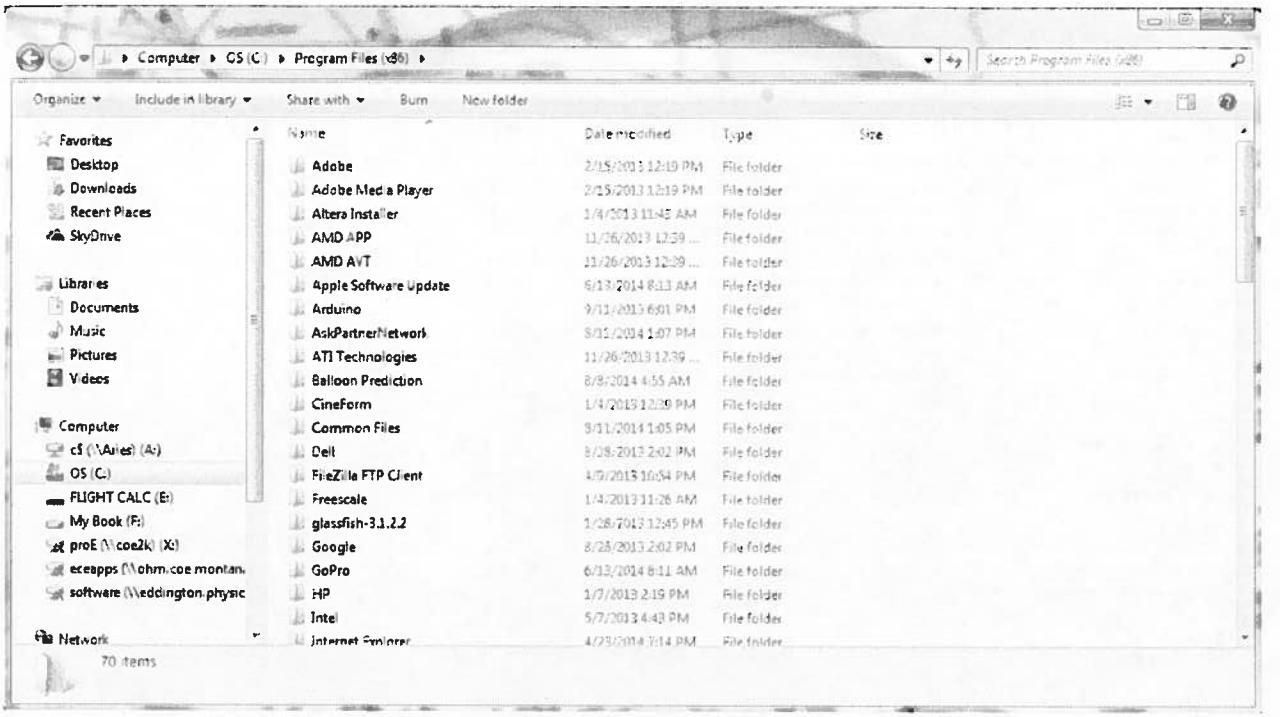
d. Now the screen should look as follows



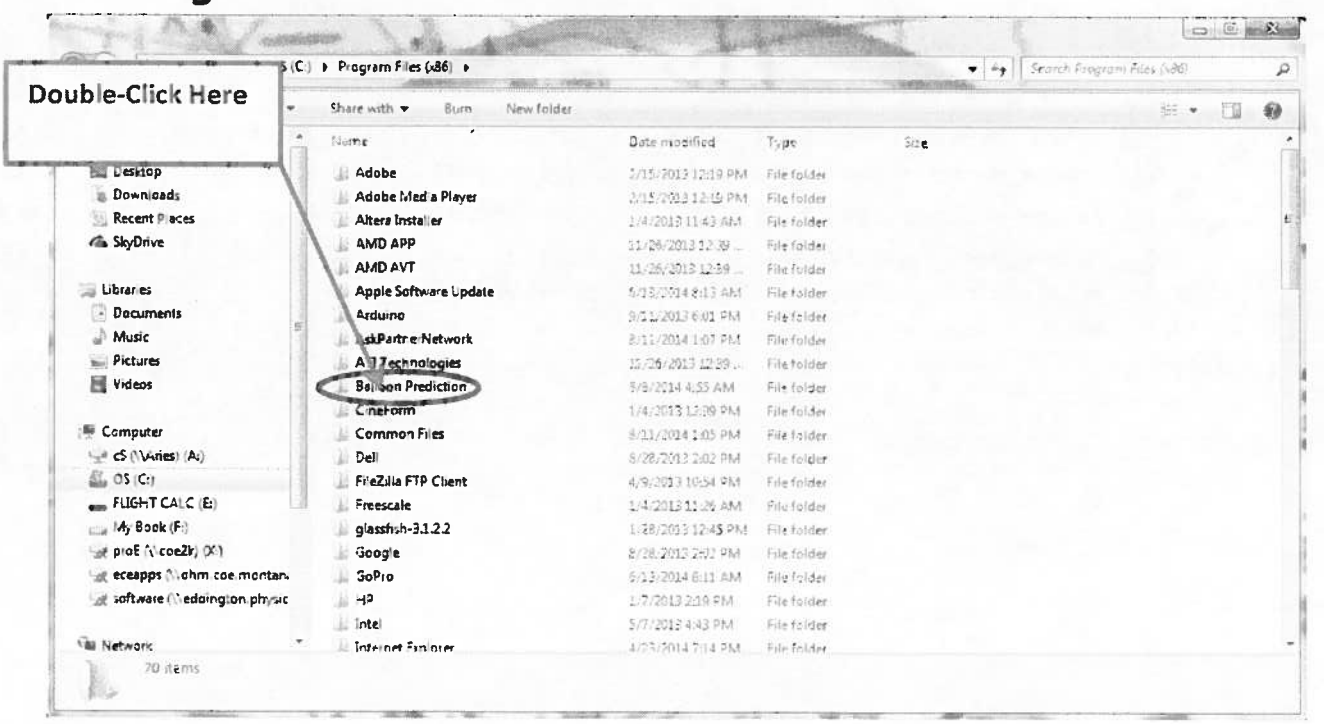
e. Go to Program Files (x86) and Double Click



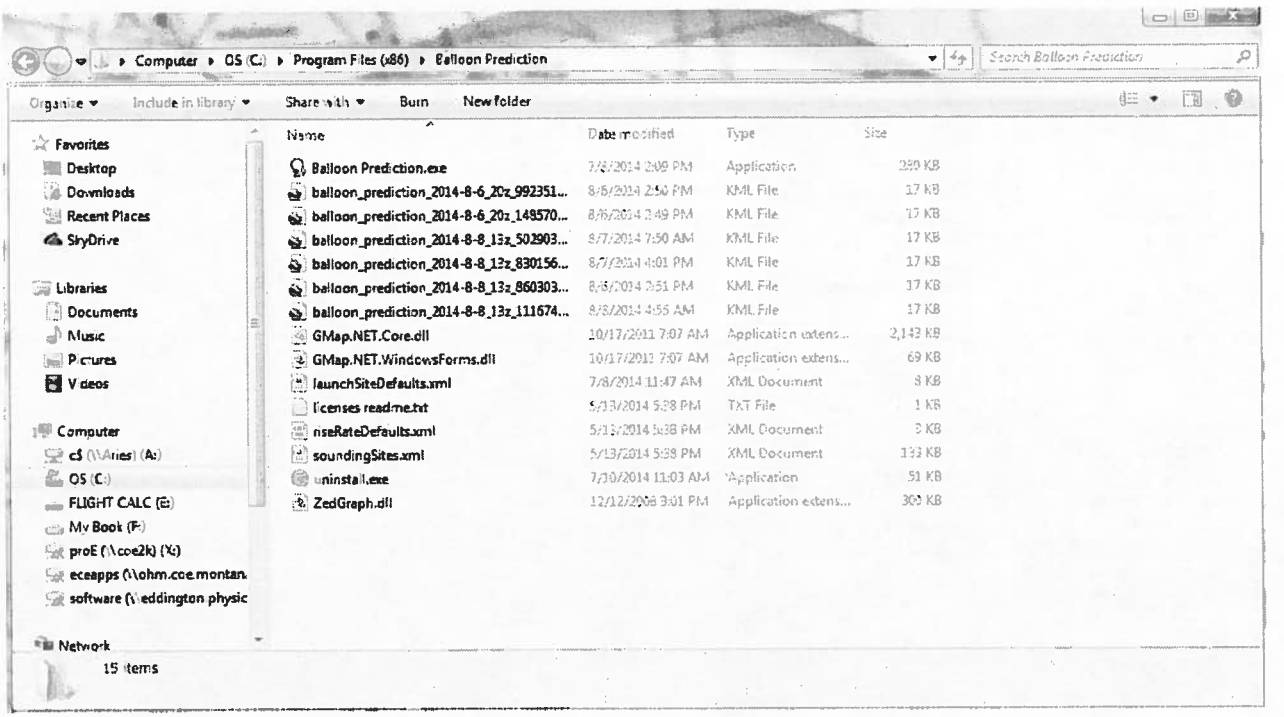
f. Now the screen should look like this



g. Double Click on the Balloon Prediction File



h. Now the screen should appear as follows



i. Now choose the desired KML file that is needed