

Balloon Altitude and Flight Time

Note: The balloon launch site is around the area of Mount Barker. The proposed launch site is at a farmer's property in Wistow. Pictures of the launch site are at: http://pipe2.darklomax.org/pics/2012-10-07_Horus_29/ and the location is: <https://www.google.com.au/maps/place/35%C2%B007'39.2%22S+138%C2%B050'51.4%22E/@-35.1279687,138.847769,388m/data=!3m1!1e3!4m2!3m1!1s0x0:0x0>. The proposed launch is scheduled for the third week in September.

Description of problem

Since the balloon can travel a long distance from launch it is vital to predict the path of the balloon, taking into account the amount of helium used, and at what altitude the balloon is likely to burst before parachuting to the ground. This will aid in the successful recovery of the payload. This investigation will look at a number of tools to help predict the balloon's path.

Note: the Habhub website: <http://habhub.org/> provides a number of useful tools to help with your predictions.

Amount of Helium Required

The height and duration of flight of the balloon is determined by the amount of helium provided. The habhub burst calculator at <http://habhub.org/calc/> calculates the volume of helium required.

What is the maximum payload of the 4 CubeSats? (See the CubeSat Specifications sheet in lesson 1 and include the payload mass in your report.) The balloon mass is 2kg (use the Kaymont balloon series in your calculations) and the ascent rate is 5m/s. Use the burst calculator to calculate the burst height, time to burst and volume of helium required.

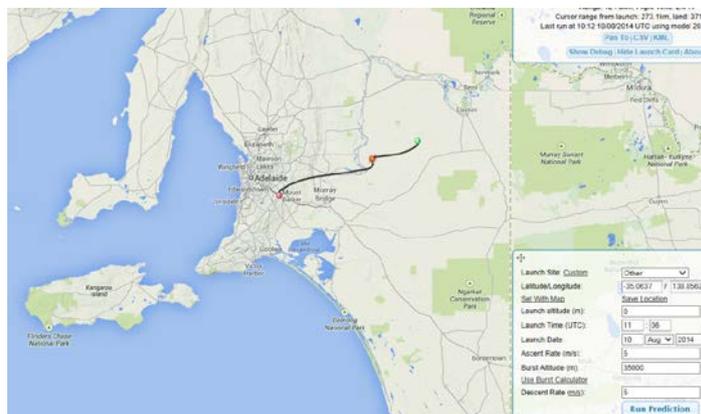
The aim is for the balloon to burst at about 34km. Using different parameters, you get two error messages. What does each mean?

Parachute Calculation

Once balloon bursts, the payload parachutes to the ground. The graph found at http://ukhas.org.uk/guides:parachute_sizing_chart will assist in this calculation. Using the payload mass previously determined, use the graph to identify the size of parachute required.

Prediction the flight time and path

The web page for this is <http://predict.habhub.org/#!/uuid=8b11f678adde76dddc0e15a28f36c56171a72093>. This starts off in England so you will need to move to Mount Barker in South Australia.



Put in the parameters as worked out in the previous section (burst altitude, ascent rate, descent rate, date and time). Try these for various dates and times to see the differences in flight path. How long in advance can you predict

the balloon's flight? Why might this be so? (You should talk to the Weather conditions group.) What does the red star and green dot mean? For different dates and times, investigate the predicted flight and parachute times.

Report

Prepare a report which:

- Describes the goals of your task
- The investigation you undertook
- Report on the maximum payload, and the balloon parameters (ascent rate, time to burst and volume of helium)
- Report on your prediction of the flight path and factors to be taken into account.