

Balloon Fest Experimental Design (BF-D)

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Purpose: Our purpose is to calculate the dimensions of certain objects by taking aerial photos of them at different altitudes. Once we have pictures of the objects we can use ratios to calculate the dimensions or we can use a given formula. Then we will compare the ratio calculations to the formula calculations for each height. Afterwards we will compare them to the calculations to the actual measurements. In other words, by taking aerial photos of objects on the ground we can find the lengths of them.

Research: The book, "50 Model Rocket Projects for the Evil Genius," helps explain what instrumentation to use. Also, it points out different errors to be careful of. The aerial photo page on the website <http://www.fes.uwaterloo.ca/crs/geog/165/apg.htm> explains in more detail, the instrumentation needed for this project. Lastly, the measuring focal length page on the website http://www.bobatkins.co/photography/technical/measuring_focal_length.html will help us calculate the focal length of the camera we will use. Because our project differs from any other, we will have to apply the rules and concepts to our own project to make sure it goes along fine.

Hypothesis 1: The increase in height will decrease the accuracy of our calculations.

Test 1: In our calculations, as we get higher, our calculations will become less accurate.

- The balloon becomes harder to see as it gets higher so the vertical site becomes less accurate.

Hypothesis 2: The ratio of camera height to focal length is proportional to the ratio of pixel length on the picture to the actual distance.

Test 1: All the object's picture lengths are set in ratios, which should relate to the ratio of camera height to focal length.

- By adding and/or subtracting x , or by multiplying and/or dividing by x , we will get a ratio of another length.

Proposed Experimental Method: Referring back to the experimental page, we will find the accuracy, precision, and resolution of our all our data and then compare them for each height. Also, we will most likely take pictures of more than one object as stated on the experimental page (table) in order to compare measurements more in depth. The very first thing we have to do is figure out exactly what kinds of measurements we expect to get. We will do this by doing test flights and using them to get a few calculations. From these we can derive exactly what we expect to get and how accurate we expect to be. Our test flights will include all of the instrumentation we will use on the real balloon fest launch. Therefore, we can get familiar with them and if needed, we can change them to our precise needs. Also during our test flight we will only be able to go up so high which means we will have to estimate to the best of our knowledge the expected measures at 1000 feet and so on. What we have to be the most careful about is the analyzing of our data. First, we have to make sure our measurements are as accurate and precise as possible. Then we can use them to figure out the assumed lengths of the objects and then compare them to the actual lengths. During these calculations we will have to double and possibly triple check measurements in order to make them as accurate as can be.

Experimental Page

f= focal length

c= camera height

p= pixel length of object on camera

r= calculated length of object on ground using ratios

a= actual length of object

F= calculated length of object on ground using a formula

Using ratios:

Compare:

Description:

Using a Formula:

Variables:

Description:

Accuracy=

precision=

Resolution=

Height	Object 1		Object 2		Object 3	
	Ratio	Formula	Ratio	Formula	Ratio	Formula
100						
200						
300						
400						
500						
600						
700						
800						
900						
1000						

Actual Measures

Using this table as an example, you can see what we are trying to do. We will have a certain amount of objects and then we will use ratios to solve the length of the each object and we will use formulas. Then we can compare the ratio calculation to the formula calculation and then compare them to the actual measures.