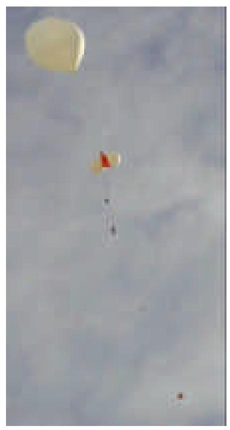
Request For Proposal

Request for Proposal (RFP) Number: 2579E301
<u>For Design Concept</u>
Of the

CU Balloon Experimental Satellite
(BalloonSat)

Project: Odyssey



Date:
October 22, 2001

Time:
3:50 PM MST

ATTENTION:

Chris Koehler
303-492-4750
koehler@colorado.edu

Overview

We intend to design, build, and launch a balloon satellite with the capability to measure radiation levels (Gamma and Beta rays) as well as light intensity up to 100,000 feet. Our design will take the form of a cube constructed out of foam core for the purpose of insulation. The instruments inside will include a Velleman K2645 Geiger/Muller counter kit interfaced with a Basic Stamp I Rev D, a HOBO light intensity logger, and two 9 volt batteries for the power source.

It is a fact that different layers of the atmosphere contain different compositions of gases, and that these gases prevent different radiation particles from reaching the Earth's surface. We are curious as to the amount of radiation found in different altitudes of the atmosphere. We also want to compare this data with light intensity readings from the same altitudes.

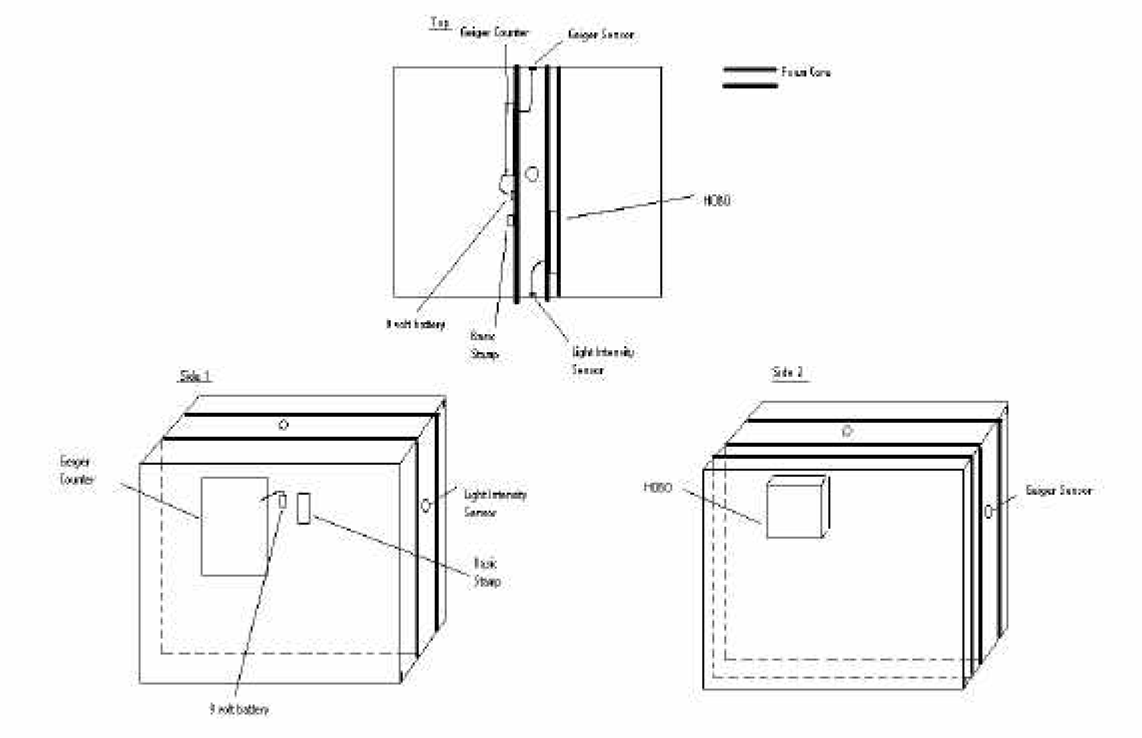
We suspect the Gamma and Beta levels will vary according to what composition the air is around our satellite. In other words, what layer of the atmosphere it is in. Also, we plan on finding a correlation between the light intensity and the radiation levels as altitude increases.

Technical Specifications

Our satellite will be a standard cube. We will use a HOBO LI data logger to measure light intensity. The logger has calibration ranges from less than 0.01 lumens/square foot to over 10,000 lumens/square foot. The logger has an efficient operating temperature range –39 degrees Celsius to +75° C so we will need to insulate the instrument. If the HOBO is not kept at a proper temperature the readings will be affected. We will insulate the HOBO between two pieces of foam core, on one side of the craft.

The opposite side of the satellite will house a Geiger-Muller counter and a basic stamp. The Geiger counter will take measurements of gamma rays and high-energy beta rays. The counter usually omits sounds determined by the level of radiation. We will attach the basic stamp to the counter, and program the basic stamp to record the levels of radiation, instead of allowing the Geiger counter to tick.

The Geiger-Muller counter will need to be purchased, as will the basic stamp. The HOBO is being donated to our project. The last piece of equipment we will need is BoxCar 3.7 software, which can be purchased for a mere $14 if it is not donated along with the HOBO.



Building our satellite will done in a few steps. The first is to assemble the outer casing made of foam core. The entire group will do this part. Next, the entire group again will work together to line the whole inside of the satellite's casing with insulation. This will be done to make sure the temperature does not fall out of the operating ranges of our equipment. Then the equipment will be positioned inside of the hull by gluing in the Styrofoam that the equipment will be secured in. This again will be done by the entire group. Before everything is put in the Basic Stamp needs to be programmed. This will be done by Eugene since he has a programming background. Finally the hardware will be installed inside of the satellite for the finishing touch.

To test our craft we will first take practice readings of the radiation and light intensity levels on the ground. Once we know that all of our equipment working properly, we will then test it to be sure the Cube-SAT will withstand the force of falling back to earth. This test will be done by dropping the Cube-SAT from a height which will allow it to accelerate to speeds equivalent to that which must be withstood upon impact with the ground.

Our groups goal for taking data is to log a reading every hundred feet. Since the accent is much faster than the decent we will focus on the decent to get most of our data. Since the decent rate will be approximately 1000 ft./min. we will need to take a reading every six seconds to attain our goal of one reading every one hundred feet. This will only occur on the way down since on the way up we will be traveling twice as fast which will only produce readings every two hundred feet.

We will start our data collection a few minutes before liftoff keeping time from when we started it to when it lifts off. From this we can tell how many data recording to ignore at the beginning. The two devices will continue to take reading throughout the entire flight, every six seconds to be exact, until long after touch down.

As far as safety goes, we should not have to use any dangerous tools in order to build our Cube-SAT, but if for some reason any dangerous tools are required, only the most extreme caution and carefulness will be exercised. During launch we will all pay attention and follow directions closely in order to minimize chances for an accident.

The only special features of our design is the insulation in order to keep all of our computer systems within their operating temperature range.

On the actual launch day our group will meet at the engineering building at about T-2:30. We will then arrive at the launch site somewhere between T-1:30 and T-1:00. At T-60 min our group will begin the preflight checklist which includes checking the insulation as well as the hull of the craft, making sure the hardware in functioning correctly, securing everything inside as well as sealing the craft. At this time we will also attach to the balloon. We will begin taking data at T-2 min. At launch we will assist it into the air. At this time the ground control takes over the tracking of the balloon until loss of signal.

Launch Site

Mission Control

Management and Cost

Schedule of Production:

Get all hardware – October 31, 2001

Prototyping Design – November 8, 2001
Complete Design – November 18, 2001
Testing Final Design – November 28, 2001
Final Launch Design – November 30, 2001

Luis Flores – Information researcher

The responsibilities for this role are finding of any information that needs to be done in order to launch the satellite. This might include the information about temperatures pressures, radiation, etc.

David Shanklin – Structure construction

This person is responsible for the building and testing of the outside of the cube, this includes acquiring the necessary materials, construction and testing of the container for the instruments.

Colin Pierce, Edward Corrigan – Equipment setup and acquisition

The people previously mentioned are responsible for purchasing and installing the instruments. They are also responsible for providing the necessary information to test the equipment.

Trannon Mosher – Equipment testing

The responsibilities for this person include testing the equipment on the ground, and comparing that data to actual values. Another responsibility is to calibrate the instruments if necessary.

Eugene Bazyl – Data analysis

The responsibilities for this role are the comparison of the widely accepted data to the results produced by the satellite. Also if the experiment fails this person will need to research the reason that it failed. This person will also program the hardware's computers to meet the needs of the mission.

Eugene Bazyl: Special Skills: Programming, math;
Email: ebazyl@hotmail.com ; Major: CSEN (Computer Science);

Edward Corrigan: Special Skills: Math, science, and programming;
Email: ecorrigan@yahoo.com ; Major: ASEN (Aerospace Engineering);

Luis Diego Fonseca: Special Skills: Science, and math;
Email: diegofon@yahoo.com; Major: ASEN (Aerospace Engineering);
Trannon Mosher: Special Skills: Math, research, science;
Email: trannonm@yahoo.com; Major: ASEN (Aerospace Engineering)
Colin Pierce: Special Skills: Math, science, design;
Email: Colin.Pierce@Colorado.EDU; Major: ASEN (Aerospace Engineering)
David Shanklin: Special Skills: Math, computers, graphics;
Email: David.Shanklin@Colorado.EDU; Major: ASEN (Aerospace Engineering);

Itemized budget

Geiger: Velleman K2645 Geiger/Muller	$160
HOBO light intensity logger	Donation from Chris Koehler
Basic Stamp I REV D	$60
Two 9 volt batteries	$5
Software Programs	$40
Insulators	$20
Foam Core (2400cm2)	$40
Miscellaneous Supplies: If we have space to put more components to the camera such as a camera and for emergencies.	$30
Total amount	$355

Keeping our budget will be easy. We will adopt the KISS method here as well. We will only buy the necessary equipment with the necessary capabilities. By keeping it to the bare minimums we will be able to buy quality hardware that is not the most expensive. Doing this we will stay far inside of our budget.