TEAM KORONAS

Proposal for BALLOONSAT

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Overview

The primary mission for Team Korona is to conduct upper atmospheric science in a $10cm^3$ "Cube Sat". The Cube Sat will be launched on a balloon and carried to an altitude of approximately 100,000ft. The project will be primarily designed and run by Team Korona with support from Colorado Spacegrant and EOSS.

Mission Statement

The mission of 'The Sound of Weather' is to create a rudimentary weather sounding for the time and date of balloon launch and to observe weather patterns accordingly. The weather sounding will be compared with optical pictures of the weather environment, which will give us information on the type of climate that exists for the weather experienced during the flight of the Cube Sat.

Technical Overview

Technical Instructions

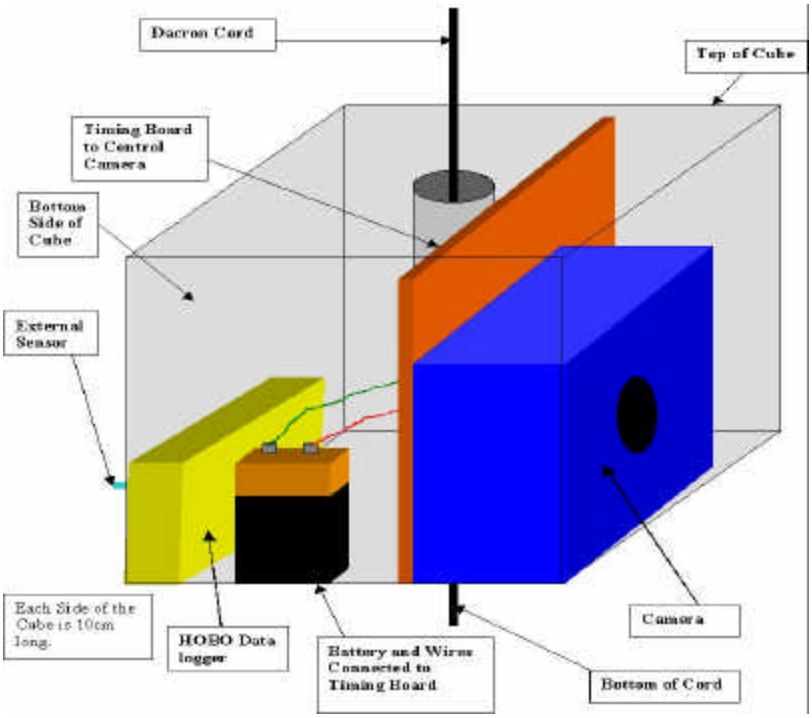
The Cube Sat will be composed of three major components. These components include a data logger for finding atmospheric conditions, power and circuitry system, and a camera to make visual observations. All of these components will be enclosed in a ten cm cube constructed out of foam core board. The cube will have two compartments; one that will be completely watertight and should be protected from the environment as it ascends and descends through the rough conditions of the atmosphere. Within this compartment will be the power source, circuitry, and camera. Each of these systems must remain water tight to perform correctly. However, the data loggers must not be insulated and water tight to make accurate measurements of the atmosphere. Therefore, the second compartment will not be water tight or insulated. These loggers will take temperature and relative humidity readings.

Hardware

In order to collect the data we will need to create our weather sounding we will need external sensors for relative humidity and temperature. The sensor we have chosen for this is a HOBO data logger, which is a small and inexpensive data storage unit, which can be programmed to take readings at different desired intervals. The HOBO we have chosen cannot record the low temperatures that the Cube Sat will experience; however it has a port for an external sensor. We will use this port with a HOBO wide range temperature external sensor, which will be able

to record the low temperatures that will be experienced. For obtaining photographs, we will use a Canon Elph Jr. Camera. It is a small and lightweight 35 mm camera, which should be relatively easy to wire to the circuit board so that we can take multiple pictures at desired interval times.

Design



Design Concerns

The first concern that we have is that our data logger will not find relative humidity levels when the temperature decreases below 5 degrees Celsius. However we believe that we will be able to obtain RH measurements within the troposphere (which is the layer of the atmosphere where all weather occurs) before the temperature decreases below this level. Our second concern, is keeping the camera, power source, and circuitry insulated and watertight. If this does not occur, our Cube Sat will not be able to correctly function and gather data and the possibility of collecting clear pictures will greatly decrease. Lastly, we will have to test the durability of our Cube Sat, as the Cube Sat will be blown forcefully around and will impact the ground at a fairly high speed. It will also experience very low temperatures. We will simulate these conditions to make sure that our Cube Sat will survive all aspects of the trip.

Testing

In order to ensure that our Cube Sat will withstand the harsh environment that it will travel through, we will perform four tests. Our first test will show which

epoxy is the best for building our cube. In order to test this, we will attach two pieces of foam core together first with hot glue and then with JB weld. We will then test the pieces for durability by pulling and pushing on the joints.

The second test will be to make sure that the harsh cold of the upper atmosphere will not damage or inhibit any part of our system. We will test this by placing the Cube Sat in an insulated cooler with dry ice while it is operating as if it were on the launch and then checking to make certain that all systems preformed as desired.

Our third test will test the structural integrity of our Cube Sat. The third test will simulate the harsh jostling experienced due to the high winds while attached to the weather balloon. We will attach the Cube Sat to a string as if it were on the balloon and then proceed to jerk and jostle the Cube Sat. Once finished, we will check to insure that all systems are still intact and in working order.

Our fourth test will simulate impact with the ground experienced while landing or possibly during launch. We will take our Cube Sat and push it down a short flight of stairs (7-8 steps). We will then test to make sure that all systems are intact.

Construction

All members of the group will help construct our Cube Sat. The Cube Sat will consist of four major parts, the shell or cube, the HOBO, the camera, and the timing circuits for the camera. All parts will be constructed at the same time so that changes can be made continuously. The shell or "cube" will be constructed out of foam core using hot glue or another epoxy that will be determined through testing. It will consist of 6 walls in a cube shape with a plexi-glass opening that will allow our camera to take pictures. There will also be one or two holes to allow for probes. The HOBO will be attached to the one side of the cube. We will also wire the HOBO accordingly. The timing circuits will be in the middle of the cube and separate the HOBO from the camera. The camera will be on the opposite side of the cube and insulated from the elements and wired to the timing circuits. The camera and the HOBO as well as the battery and other items will be grounded to the bottom side of the cube to add weight to the bottom side and hopefully accomplish a bottom side down final landing. TADA!

Safety

Since safety is very important, our team will try to follow certain rules and procedures when working with any type of harmful materials or objects.
When building the Cube Sat we will not do anything that will endanger anyone in any way. When we use the machine shop we will be careful, especially when using sharp objects. Safety goggles and gloves will be worn when necessary.

When testing our Cube Sat will take into consideration any danger that might occur and take it into account the real launch and recovery.

Launch Program

We will begin preparing for the launch about two or three hours prior to launch. All the final aspects will be taken care of by then. The only thing left to do is to follow the procedures and make sure everything is in order and ready. Then the moment we are all waiting for, launch!

Schedule of Events

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
21	22 RFP Due	23	24	25	26	27
28	29 Order parts pending approval	30	31 Instruction in Circuit Lab	1	2	3
4	5 Presentation to Industry	6	7 Begin Construction	8	9	10
11	12	13	14	15	16 Construction Complete	17
18	19 Begin Testing	20	21	22 Revise Design if Needed	23	24
25	26 Final Revisions	27	28 Readiness Review	29	30	1 Launch!
2 Back Up Launch Date	3	4				

Management

Science Team:

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Geno Tavella: Construction and Testing (Conceptual Design Artist)
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Materials

-Foamcore Board (10cmx80cm)
-HOBO H8 Logger for RH/Temp/2xExternal
-BoxCar 23.7 Software
-Cannon ELPH Jr.
-9V Battery
-Eyelets
-Hinges
-Battery Clips
-Foil
-Resistors
-Capacitors
-Plexi-Glass
-Wide-Range Temperature Sensor
-Wires
-Circuit Board

Budgets

Cost Overview

Temperature Sensor	$23.00
HOBO H8 Logger for RH/Temp/2X External	$95.00
BoxCar 3.7 Software	$14.00
Cannon ELPH Jr. Camera	$89.00
9V Battery	$2.69
Capacitors (set of 20)	$2.99
Resistors (240 pieces)	$11.95
Foil	$3.45
Tax and miscellaneous construction items	$85.00
Total	$325.00

Mass Budget

Circuit Board	18g
Camera	200g
HOBO data logger	30g
Foam Board	75g
Battery	15g
Total	336g