Proposal For Balloon Satellite

Gear Heads
Project: Giza

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Mission Statement:

We plan to design and build a satellite design whose primary purpose is to right itself upon landing and release a miniature remote-controlled vehicle. A highly optional and concurrent goal is to experimentally determine whether a GI-Joe parachute figure is able to survive re-entry.

Overview:

Our reasoning behind the primary goal is to demonstrate self-righting mechanisms can be much simpler and less dependant on system integrity than they currently are, and that this can lead to increased chances of survivability of the payload through redundant systems that require minimal resources. The optional goal is to demonstrate the feasibility of a large-scale parachute toy invasion using cheap deployment devices.

Although the successful release of the vehicle will be completely dependant on the proper functioning of the self-righting mechanism, we will still be able to test the functionality of the rover post-landing and we fully expect it to survive. Because we plan to use composite hinges for the self-righting mechanisms, the success of deployment requires a fully-functioning power and timing set up. Barring any failure in the heating elements, that phase should be successful, as well as the resulting deployment of the rover. However, in regards to the optional goal, it is anticipated that the parachute will be torn to shreds with the soldier still intact. If that occurs, we would recommend a kevlar/nylon parachute material instead of the current polyethylene material.

Technical design and building:

Our Balloon Sat is designed for an upright landing and the deployment of a rover, as well as split screen shots of the carrying balloon and the ground, temperature and pressure readings at 100,000ft and decent and assent speeds. Instead of using the conventional box shape it is more effective for our purposes to use a pyramid design. It will be lighter and more effective on landing upright. Not only will our design be lighter it will also have better landing and deploying system and will cost less then any other design used on the experiment.

The reason for the pyramid design is simple. Deployment of a rover will be more effective. Composite hinges will be attached to the base and the sides of the pyramid. Thus when the landing takes place it won’t matter what side it lands on, because the activation of the hinges will allow the Sat to come to an upright position on deployment.
This open sat idea will not only allow for an upright landing, but will also allow for easy deployment of our rover. Because our sat will open, total insulation will not be achieved by the outside structure alone. More insulation will be provided on the inside of the Sat around all vital components. Also to help reduce weight the Sat will be created out of Styraphome. This lightweight material combined with a more rigid covering creates the optimal structure for the Sat.

The camera will have a split screen. This will be achieved by mirrors. The lenses will point into a tube with two mirrors. One mirror will direct the cameras view to the balloon and the other towards the ground. This simple design will allow for two pictures to be taken on the same shot, and it will reduce weight and energy that would otherwise be spent on repositioning the camera.

The Rover will be a small remote controlled car purchased at any toy store. It will be small, about 1.5in by 1in. Its small size will reduce weight, and save space that can be put towards insulation and other systems. Though the rover is small in size it has tremendous speed, allowing it to cover a large amount of terrain in a short period of time. It will be controlled by one of the team members, using a simple remote control.

Our temperature and pressure sensors as well as our other systems, besides the rover, will be powered by a HOBO. This small onboard computer allows for the recording of pressure and various altitudes as well as temperature. It will be preprogrammed into the HOBO at what altitudes the readings will be taken. The HOBO has 4 ports two of which will be taken up by small temperature reading sensor, and a pressure reading sensor. These sensors will be preprovided through Space Grant. The other slots can be used to activate the heating elements that will be used to activate the composite hinges. The HOBO will be programmed to start the heating elements through either an altitude change or impact, depending on what is more effective for our purposes.

The Composites are the key to our craft landing upright and our rover deploying. By placing the composites on the base and the sides of the Sat, it will force the craft to open upright. When they deploy no matter what side the Sat is on it will be forced back into an upright position. Also by opening the Sat it will allow our rover to deploy, and because it is forced back into an upright position the rover will have a smooth and easy launch off the Sat. The composites are what make our Sat optimal for an upright landing and a perfect rover launch.

The heating elements are what will make the deployable craft possible. The heating elements will be attached to the composite hinges and when activated will make the
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hinges deploy. Because of the power needed to activate the composites the heating elements will have to be placed on a cycle. The reason for this is weight. It takes several batteries to activate just one composite hinge, it doesn’t take all the power in the batteries, but the high voltage is needed. This cycling system will be just as effective as deploying all the hinges at once.

For power we will be using ------- batteries. These batteries will be going towards powering the camera, the heating elements, and the HOBO. With relatively few items to power battery weights shouldn’t be a problem. The most weight is going to come from the batteries needed to power the heating elements. Our rover has its own power supply build in. All things considering our craft requires very little power to complete its mission.

Our craft has a unique design and great potential. Its simple design increases its reliability. We are sure that this craft will be one of the most successful Lander craft ever deployed. It is not only reliable but cheaper too. With not luck at all our craft will come in under our $200 budget. If you have any questions about our craft or what it is capable of, speak with our team lead Ashleigh Bailey.

Team contributions:

All the team members will be participating in the build of the balloon Sat. However, we will most likely be having certain people working on certain parts more than the other team members due to talent and interest. We will optimize the talent in the specific areas to insure that the rocket be built in the best manner possible.

As well as making sue everyone is participating and not being left out, or left with out work, we will make sure that if some one strong opposes doing some part of the project, their wishes will be honored, and we will find other work for them to do.
## Budget

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<th>Description</th>
<th>Source</th>
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<th>Weight</th>
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<tr>
<td>Hobo Data Logger</td>
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<tr>
<td>Temperature Sensor for Hobo</td>
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<td>Pressure Sensor</td>
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<td>Rover</td>
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**Total =**

|                |                | $ 112.99   | 491 grams|

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Testing:

In order to make sure our Sat will survive the harsh conditions that it will be put through, a series of test have been arranged to test the durability of our craft. First we will test how our craft performs in low temperatures. To do this we will place our craft in a freezer for the same period of time that it will be in flight. Shortly after removing it from the freezer we will test and see if the Sats systems still function. Second we will test the composite hinges. We will first do so on a flat surface without an impact, and then when we find that it works properly we will drop our craft from a height of 5m. (We will add dead weight to simulate the total weight on the actual freefall.) This will tell us if our composites will still function after a large impact. Finally, we will test our craft for high wind speeds. This will be accomplished by placing a rope though the hole that was created for the Sat to be attached to the balloon, and spinning it around it a circular motion. These three tests will give us the proper results needed to deploy our craft to perfection.

Launch Program:

First, we hope to have everybody on the team present, and this will be arranged either individually or as a carpool. Once present at the field, we will ascertain, to the best of our abilities, that everything arrived intact and functional. If there are any serious problems, we will attempt to the best of our abilities to fix them, but, barring any critical failures, we will hopefully be able to deem it fit to fly. Following that, we will proceed to make certain the balloon is securely fastened, and then start tying our satellite to the cord. Finally, after double-checking the fasteners, we will joyfully watch our creation rise into the heavens.

Safety:

Every safety precaution will be taken in order to protect the team members. We will maintain a professional attitude about us, to insure that no one gets hurt or injured in any manner, especially to the point that they would no longer be able to participate in the project.
Pyramid after it has landed; opens to allow “rover to exit container.

Pyramid as it will be launched.
October

Sun Mon Tue Wed Thu Fri Sat

1 2 3 4

5 6 7 Proposal due 9 10 11

12 Present. due 14 In class team time 16 Team meeting 18

19 20 Team progress reports 22 23 Team meeting 25

26 27 Team progress reports 29 30 Team meeting

Gear heads
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