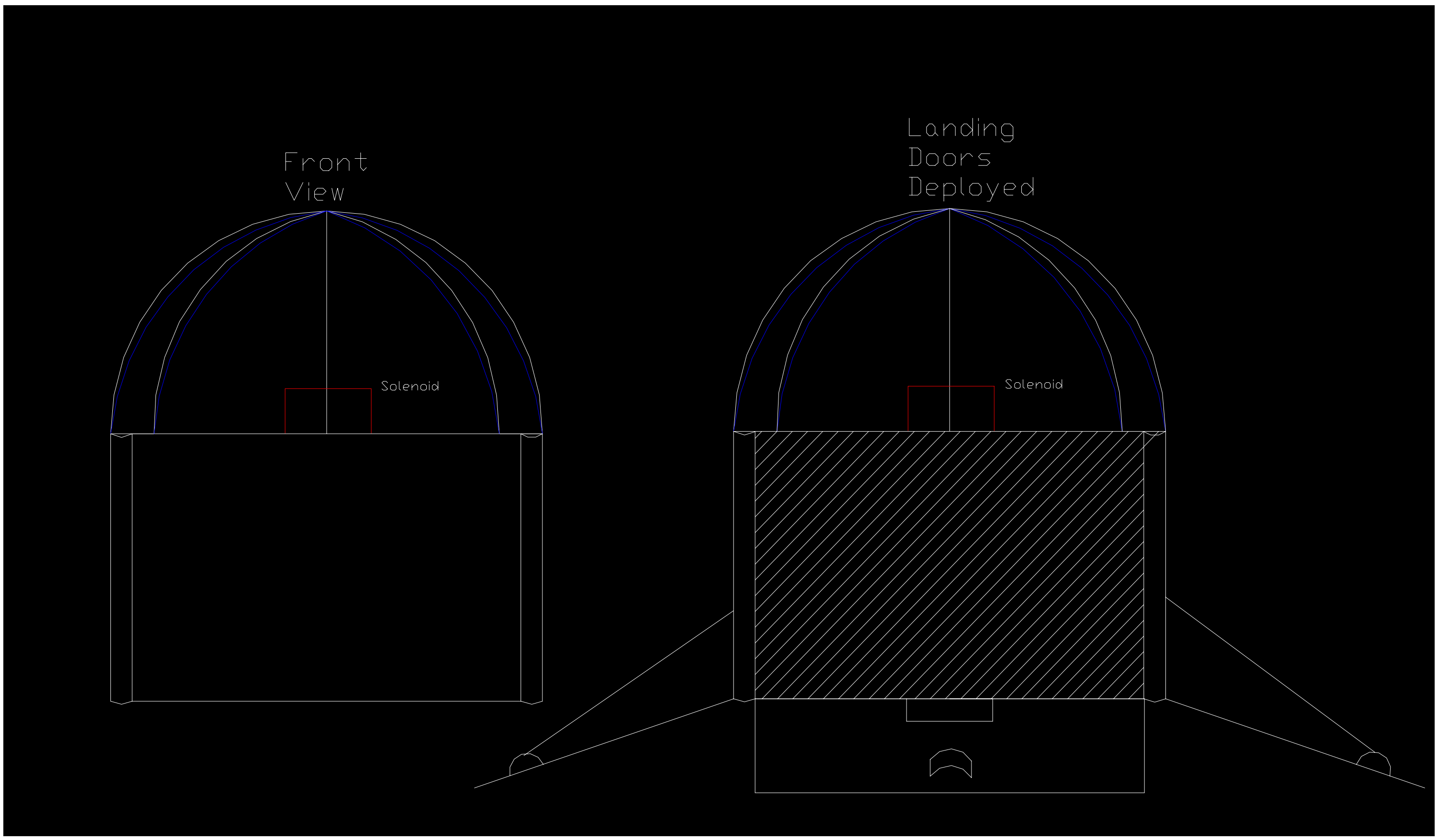
Team DayturaSat

Presents

CUBESAT



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OVERVIEW:

Team DayturaSat plans to build a CUBESat that will travel into near-space at 100,000 feet, and then return to Earth withstanding speeds of Mach 1. During its journey, DayturaSat will take digital pictures of the upper atmosphere, as well as temperature data. Upon return to Earth, the DayturaSat will unfold itself and return to an upright position.

Team DayturaSat hopes to discover if the unfolding design will effectively result in an upright position. Also, we will examine how the BasicStamp micro controller will perform at high altitudes, speeds, and impacts.

The CubeSat will examine options for future probes that must be able to adjust their orientation to an upright position. Additionally, the micro controller onboard the CubeSat will autonomously control the collection of data, and the CubeSat will protect the data on its journey back to Earth.

TECHNICAL OVERVIEW:

The DayturaSat experimental design will include an internally mounted digital camera and digital temperature collector. The outer framework will consist of aluminum side paneling and lengths of aluminum rod at the corners to provide the cube structure for the aluminum side panels to attach to. Four aluminum side panels will be on base-attached spring hinges to be dropped down from the body of the structure on landing. Strings will be attached to the doors and will be released on landing by tripping a latch, dropping the doors to push the satellite up onto its bottom side.

Additionally, there will be a two aluminum arches attached to the top corners so in the event the satellite lands on its top, it will tip onto a side, the side doors will open, and the satellite will be righted. An aluminum tube will be in the center of the satellite through which to run the balloon cables and to provide support for the arches. The micro controller will be programmed to activate the solenoid at a certain time and when the solenoid is signaled, it will release the latches, thereby dropping the doors. A CAM system, linked to the solenoid and attached to the central tube, will unwind the string. The solenoid will be connected to the 9V battery.

The BasicStamp will serve as the micro controller. Instruments will be controlled by this small device, which will be connected to the digital camera, the temperature sensor, and the remote-control upright deployment system. The instruments will be connected by relays that connect into the Stamp's 7 pin system.

The digital camera lens will be positioned by a side opening in a panel and take pictures from an angle tilted toward the Earth's surface. The instruments will share power from a 9V battery by spitting the voltage with a series pass regulator.

Hardware:
Kodak Digital Camera
Temperature Sensor
BasicStamp (including wiring kit)
Relays
Circuit board
Aluminum sheeting (4 3x5, 2 5x5)
Aluminum rods (12 in)
Nuts
Bolts
Spring hinges (4)
Hollow aluminum tube (7 in)
Bushing
Eyelets (4)
Misc. Electronics
Series pass regulator
9V Battery

All members of the team will work jointly on the construction of the satellite.
The first phase of testing will be to find the right type of spring to hold the doors closed until the landing and provide enough strength to push 500g up right. We will do this by mounting several different types of springs on doors and testing to see which one optimally lifts the satellite onto its side. Next, we will test a full scale model by dropping it to make sure it lands upright. We will test the equipment to make sure it works properly, and finally we will test the electronic equipment to make sure the system works and it can withstand pressure.

Cables will be run through a tube in the center of the satellite to be connected to the launch balloon and the landing parachute.

Safety procedures include taking an orientation class to use the CU lab equipment and tools for construction. Safety glasses will be used during construction and established lab rules will be followed.

The most prominent feature of the design is the spring-based system to open side doors to right the satellite in the event it lands in its side. This is the most complex and questionable part of the design. Hopefully, this system can provide some insight into whether this type of design can be useful in future experiments.

MANAGEMENT:

The launch date will be met by establishing and meeting smaller deadlines including concluding the design phases, testing materials, and remaining diligent to finish construction.

Schedule:
July 27- Complete design, test weight requirements
July 30 - Get all hardware
July 31- Finish CAM and latch design for doors
August 1- Test CAM and latch design
August 3- Prototype design to drop
August 8- Electrical work completed
August 9- Test electronics
Ausgust 13- Mount Instruments
August 14,15- Final testing
August 17- Presentation
August 25- Launch

Roles:	Contact
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COST OVERVIEW:

This budget will be kept by making educated guesses about quantities of materials, being resourceful with materials, and by buying after researching prices.

Budget:

Material:	$	
Digital Camera	120	
Temperature Sensor	30	
BasicStamp Kit	80	
Fishing Wire	10.72	
Motor door deployment	40	
Frame Materials		
Hinges		4.49 x2
Al angle		4.49 x2
Sheet metal		19.99
Misc. hardware		3.00
Eyelet		0.19 x4
Spring		2.49
Spring		2.79
	46.99	
Electronics		
PC board		1.29
9V Bat. Holder		0.99
PCB Standoff		1.49
5V Reed relay		2.49 x2
Battery clips		1.49
Resistors		0.69
Switch		2.89 x2
Solenoid		5.00 x2
Series pass reg.		1.25
	27.96	
Total	355.67	