

High Altitude Weather Balloon Project: Project Log Part 2

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ABSTRACT

This paper describes the current state of the high altitude weather balloon project as of March 4, 2008. The high altitude weather balloon project is a project run through the Applied Science Research class at Menlo School. The goal of the project is to launch a weather balloon into near space, approximately 100,000 feet.

Keywords

high altitude, weather balloon, ATV, PIC microcontroller

1. INTRODUCTION

Current work on the high altitude weather balloon project has consisted of working on acquiring GPS data and writing the data to memory.

2. PARTS PURCHASING

2.1 Budget

Total Spent: **\$217.26**

Budget Remaining: **\$82.74**

2.1 Part Spending

The part list is detailed in Table 1.

Part	Price	Quantity	Total
Initial Budget			\$0.00
Rockwell GPS	\$31.99		\$31.99
5.0M Pixel Webcam	\$11.88		\$11.88
GPS Passive Antenna	\$8.94		\$8.94
Sensors	\$41.07		\$41.07
Flash Connector	\$2.38		\$2.38
	\$2.99		\$2.99
	\$4.61		\$4.61
	\$1.16		\$1.16
	\$3.00		\$3.00
	\$1.55		\$1.55
	\$4.09		\$4.09
	\$1.91		\$1.91
	\$3.12		\$3.12
1GB MicroSD	\$9.11	2	\$18.22
IC 64MB Flash	\$6.99	2	\$13.98
IC 16MB Flash	\$2.37	2	\$4.74
Crystals	\$0.58	2	\$1.16
	\$0.58	2	\$1.16
	\$0.75	2	\$1.50

connection. Without the antenna, there would be no signal, which would prevent the GPS from receiving data, which is shown in the data acquired by the GPS. To remedy this problem, a new GPS antenna was purchased with the correct connector type.

4. MEMORY

4.1 Different Options

There are two different options for storing the data. One would be to use a 1GB MicroSD card. The other would be to use a 16MB or 64MB flash surface mount chip.

4.1.1 MicroSD Card

The MicroSD card presents two options. It could be used as a simple memory storage, which would be similar to the flash chips. The other option is to hardcode a FAT file system (the file system used by MS-DOS) onto the chip. This would allow the chip to be able to plug into a computer and be read. This would be good, as well as elegant, because it would ease data recovery. Each data acquisition (assumed now to be 1 per second) would be able to have its own data file. However, it could present problems because by hardcoding the files onto the chip, the computer would have to deal with millions of files, many of which will have no data in them. Secondly, this would require manually searching through each file individually to figure out which one was the last to have data on it. Another problem with MicroSD is that because it is not soldered straight onto the board, mechanical error from the connections could result in data failure during the flight.

4.1.2 Flash Memory Chip

The flash memory chip would work better than the MicroSD card because it requires less function calling and data

protocols to read and write. This will make data acquisition faster and more reliable. To read the data, this method will require using the PIC microcontroller to read the flash data out to the serial and into a computer, and would not be quite as elegant as a plug in card. However, implementation and mechanical durability make the flash memory chip the right memory option for this project.

5. PIC MICROCONTROLLER

The PIC Microcontroller used was a PIC16F917, however the PIC16F887 suits the needs of this project better. The PIC16F917 pins for SPI (Serial Protocol Interface), which are used for interacting with the flash memory chip, overlap with pins used for the AUSART (Addressable Universal Synchronous Asynchronous Receiver Transmitter), which is used to communicate with both the PC and the GPS module. Besides slight pin alterations, the PIC16F917 and the PIC16F887 are identical.

6. REFERENCES

- “PIC16F87x Data Sheet” Microchip Technology Inc., 2001.
- “SD Specifications, Part 1, Physical Layer, Simplified Specification” Version 2.00, SD Group, 2006.
- “Microsoft Extensible Firmware Initiative FAT32 File System Specifications” Version 1.03, Microsoft Corporation, 2000.
- “AT45DB161D 16-megabi 2.5-volt or 2.7-volt DataFlash” Atmel.
- “NMEA data”
<http://www.gpsinformation.org/dale/nmea.htm>