High Altitude Balloon Flight Telemetry and Remote Control Upgrade Winter 2009

February 2009

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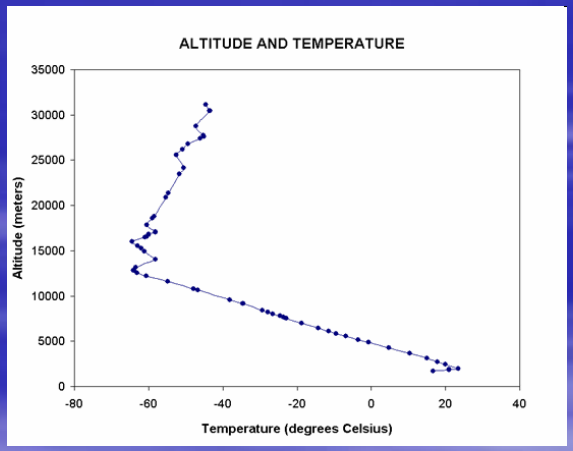
- New TNC
- New Transmitter
- New Receiver
- Advantages/Disadvantages of New Transmit/ Receive units vs. Old Transceiver
- Other Goals

Group Members

- Team
  - Andrew Crowdy
  - Steve Overmyer
- Advisors
  - Dr John Wu
  - Daniel Rahn
  - Bruce Rahn
- Other Teams
  - Two Mechanical Engineering groups
  - Two Electrical Engineering groups
  - One Computer Engineering Group

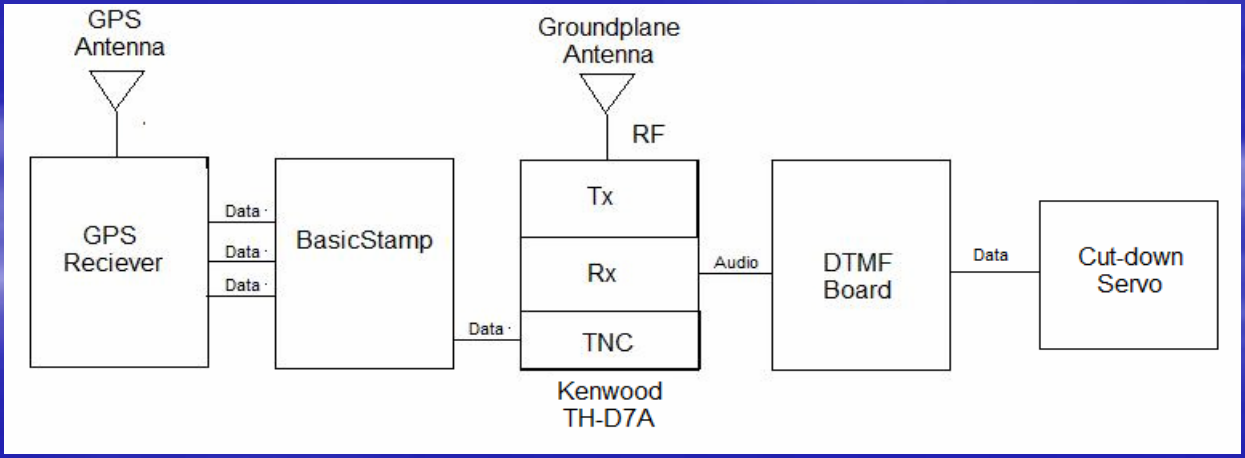
Design Specifications

- Weight
  - According to FAA regulations an unmanned package must weigh under 12 pounds
- Climate
  - As altitude changes the temperature decreases at about 3 degrees F per 1000ft
- Ruggedness
  - Must be able to resist falls

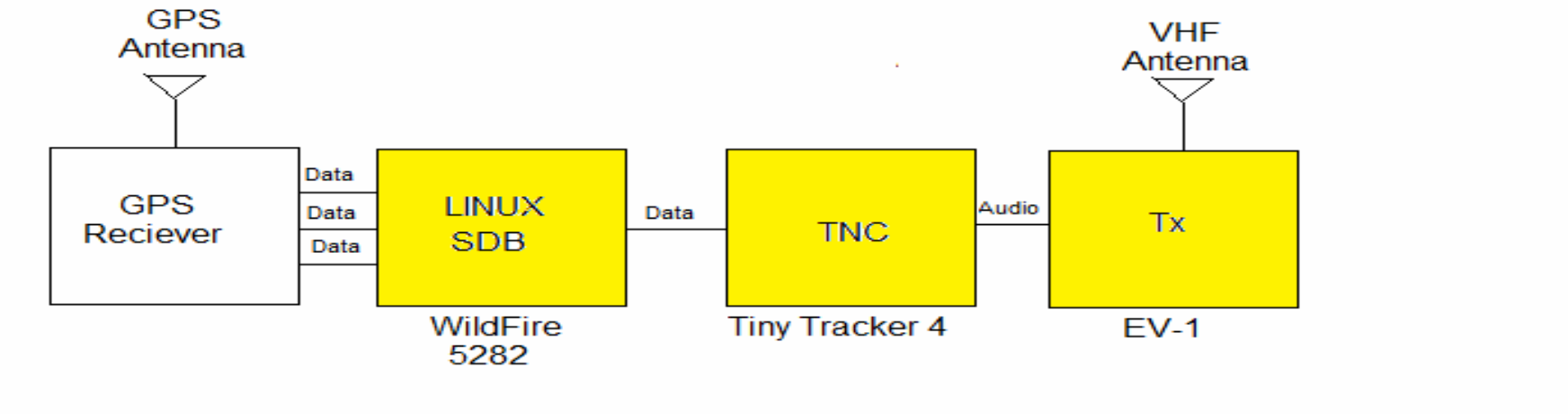


Old Telemetry System

- GPS
- Single Board Computer (SBC)
- Transceiver



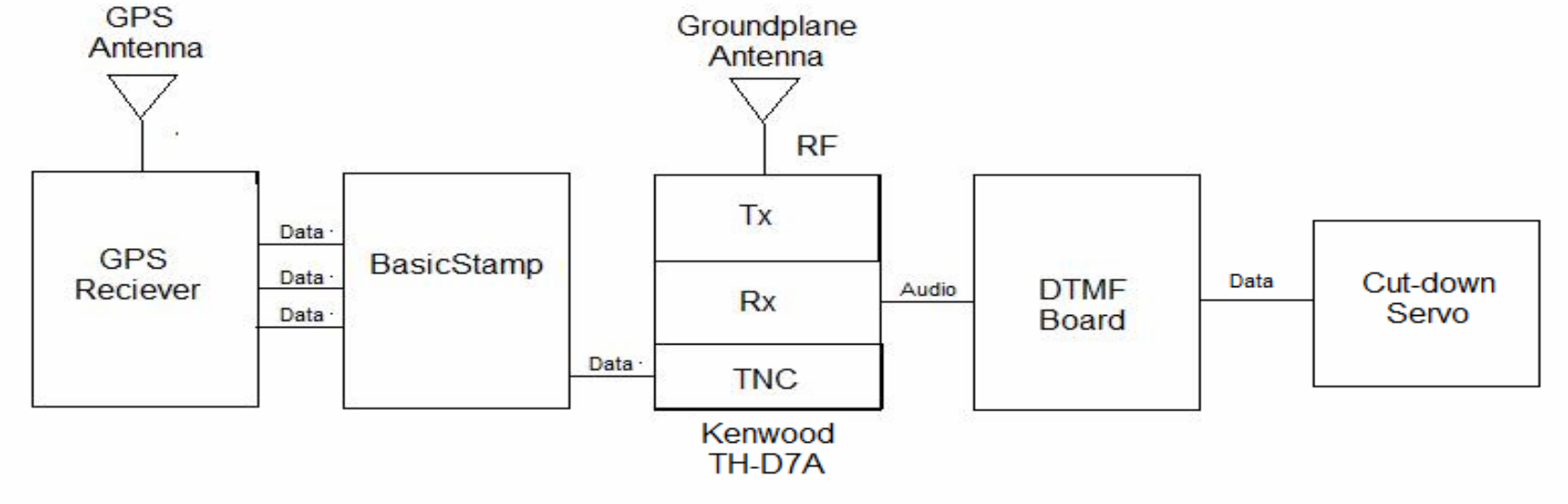
Our Telemetry System



- GPS
- SBC
- Terminal Node Controller (TNC)
- Transmitter

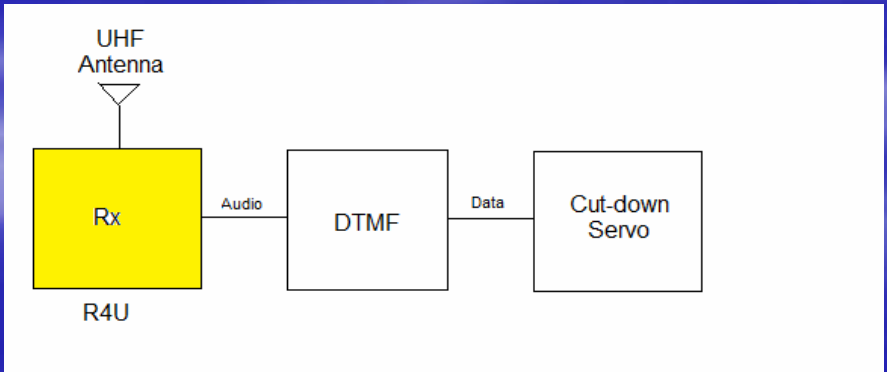
Old Control Segment

- Shared Transceiver
- Dual-tone multi-frequency board (DTMF)
- Cut-down Servo

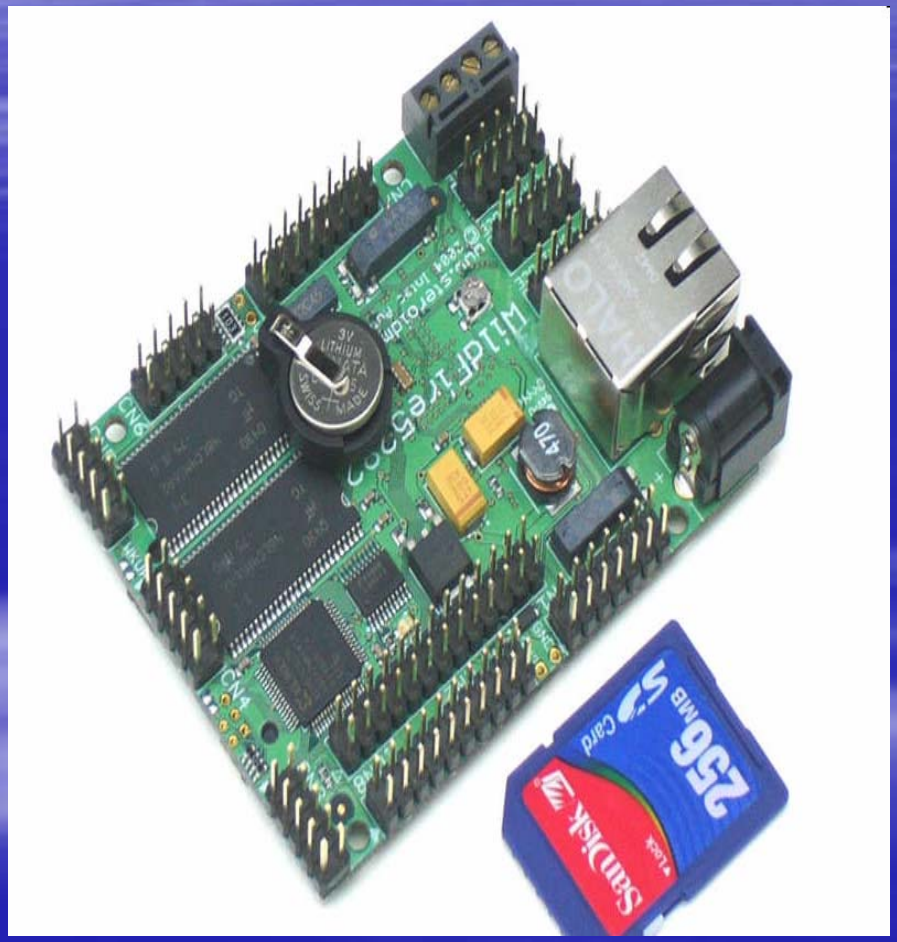


Our Control Segment

- UHF Receiver
- Dual-tone multi-frequency Board
- Cut-Down Servo



New Single Board Computer



- WildFire 5282
  - Uses Linux operating system
  - Programmable in uCLinux
  - Designed for industrial applications
  - 64MHz FreeScale Integrated ColdFire Version 2 Microcontroller
  - Costs $199
  - Already have in stock

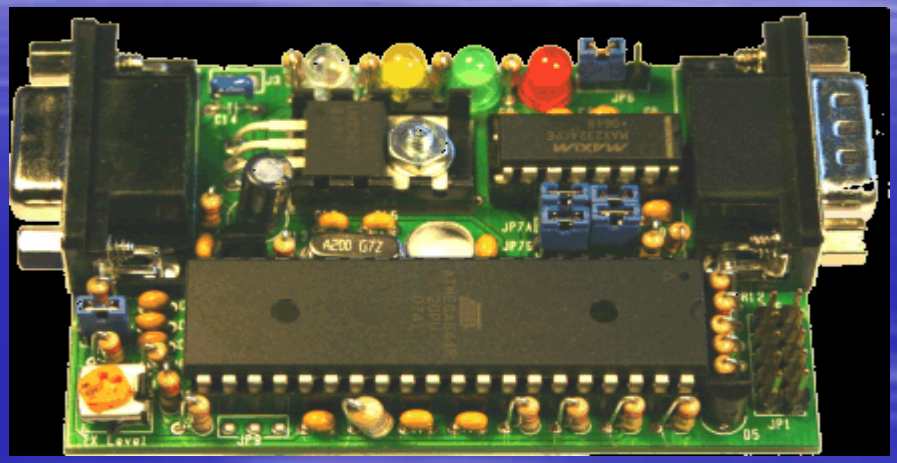
Advantages/Disadvantages of New SBC vs. old SBC

- Advantages
  - The WildFire has a more stable operating system
    - This leads to less likely errors
    - One can use uCLinux instead of PBASIC
  - Uses a external memory SD card
    - Stores data so reboot does not reset or corrupt data
    - Can easily change code
    - Can have multiple code ready

    More Rugged
    - Designed for harsher environments
  - Better operating system
    - Faster 64MHz to 20MHz
    - A thousand times more memory
- Disadvantages
  - Weighs slightly more
  - Must change premade code to new system
  - More expensive $199 vs. $75

New TNC

- Tiny Track 4
  - Converts Data signal from SBC to audio for output
  - Uses KISS protocol
  - Costs $65
  - Already have in stock

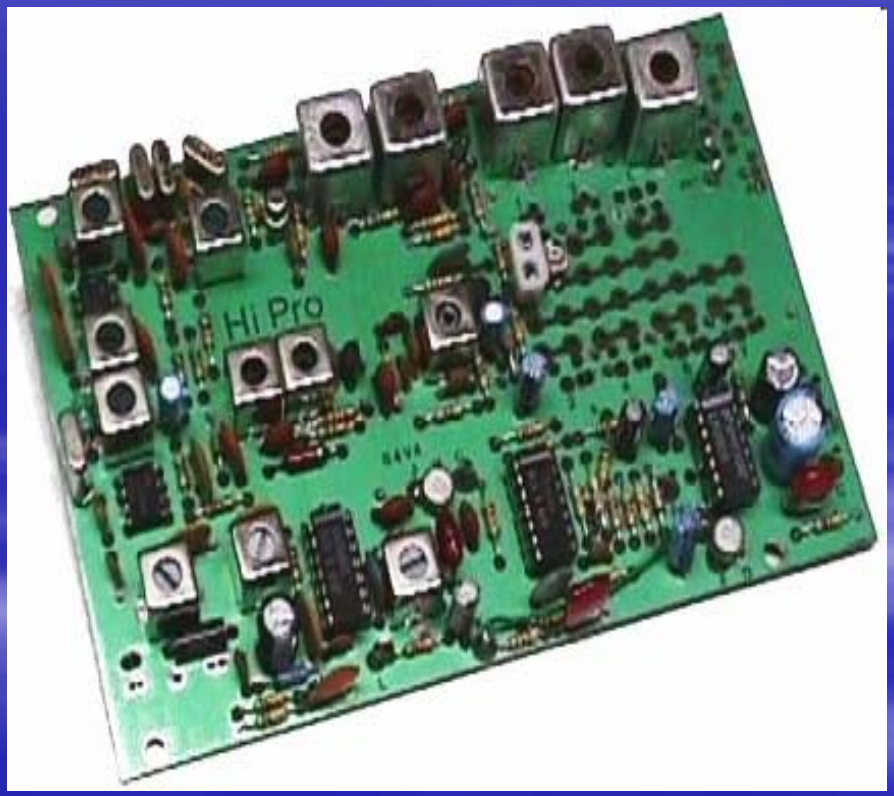


New Transmitter

- Maggorie EV-1
  - Operates 144-174MHz
  - Power output adjustable to 5W
  - 12V input
  - 750mA current draw
  - 3.875 by 6.125 inches
  - Built according to mil spec. standards
  - RF shielded
  - Fundamental oscillator stabilized
  - Costs $225

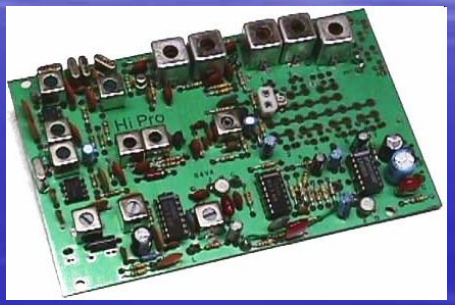
New Receiver

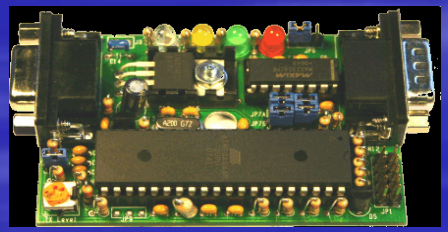
- Maggorie R4U
  - Operates at 420-512MHz
  - 12dB Sensitivity
  - 12V input
  - 90mA current draw
  - 3.875 by 6.125 inches
  - Built according to mil spec. standards
  - RF shielded
  - Fundamental oscillator stabilized
  - Costs $305



Advantages/ Disadvantages of Transmit/ Receive Unit vs. Transceiver

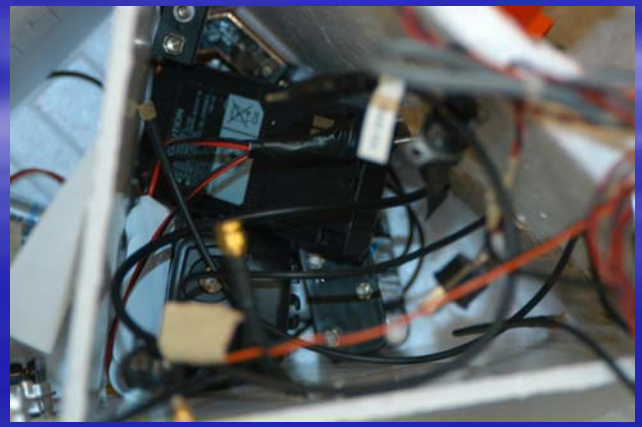
- Advantages
  - Weight
    - We are cutting about 2oz
    - Could drop more weight by refining the board
  - Adaptability
    - Can change, other units/features can be added in future with ease
  - Loose Boards
    - Can be troubleshoot and repaired
    - Gives us more adaptability
  - Power
    - Can be attached to the power bus
    - Backup can be used as the board will not reset
  - Availability
    - Can order new units and parts
    - Schematics online
    - 2 year warranty
  - Receiver and Transmitter isolation
    - The control and telemetry units will be on exclusive isolated frequencies
- Disadvantages
  - Lose Boards
    - Adds extra wiring
    - Not compact
  - Power
    - Draws a large amount of power that is not isolated from the rest of the balloon
  - Adaptability
    - Frequency changes take time and effort to get exact
    - Expensive up front cost





Other Goals

- Antenna
  - Installing a UHF dipole antenna
- Organization
  - Reorganizing the box and wiring for better organization and ease of testing



QUESTIONS