HARP High Altitude Recovery Payload

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HARP Generations:

Overall Goals:

• Build and operate a financially feasible self-guiding high altitude payload for recovering and logging near space video and sensor data.

• Exceed standards of high altitude payloads with autonomous recovery and real time data logging.

• Meet ABET accreditation of engineering standards.

Technologies Learned/Used:

• APRS tracking
• RTOS
• mbed
• Parawing parachute design
• Balloon filling
• PCB design
• FAT file systems
• SD cards
• Serial drivers
• RF antennas and digital effects
• Watchdog timer
• Multi-threading
• Thread synchronization
• Thread-safe queues.

mbed
ARM
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Gen1. Tethered Flight


Tethered Flight Setup

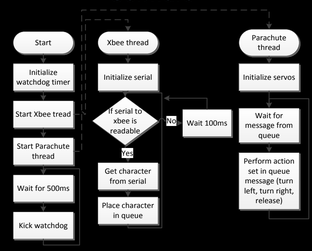
Description:

•Minimal HW and SW components
•Release system and servo controls are manually triggered via Xbee wireless communications

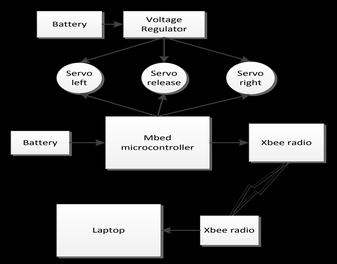
Goals:

• Demonstrate a working release system
• Discover scientific analysis of the parachute functionality

Software



Hardware



Results:

Test 1 HW:

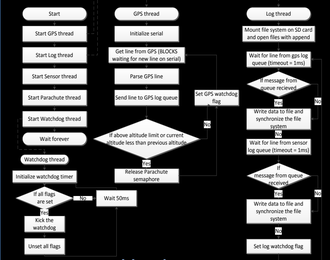
• Hard left spiral caused by uneven weight in payload
• Little forward movement caused by constant turn

Test 2 SW:

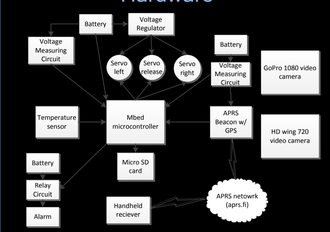
• All software functionality proves reliable and functional

Gen2. Parachute Controls

Software



Hardware



Description:

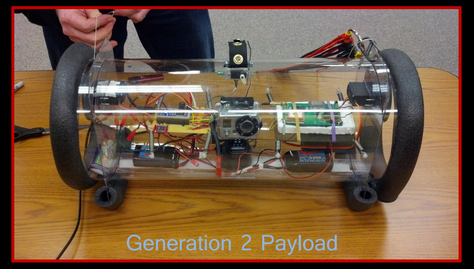
• SW reads and logs GPS altitude thread to SD, then compares to given release conditions
• Initiates RTOS. Watchdog timer and HW components
• Compiles GPS data and produces dead reckoning heading

Goals:

• Establish system functionality
• Analyze data from GPS
• Analyze mbed output to servos

Results:

• The evidence from video analysis proves the desired glide slope ratio is achieved
• GPS data describes the payloads position
• Data logged from GPS and mbed indicate sustained flight correction probabilities

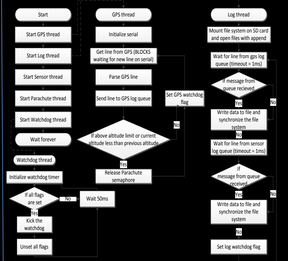

Generation 2 Payload

Gen3. High Altitude Flight

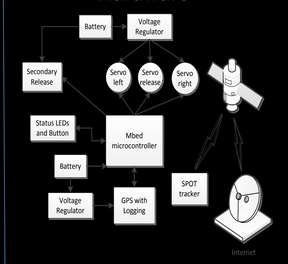
Description:

• Integrate APRS tracking beacon for real time ground level position tracking
• Confirm internet - GPS - payload connectivity

Software



Hardware




Generation 3 Assembly

Goals:

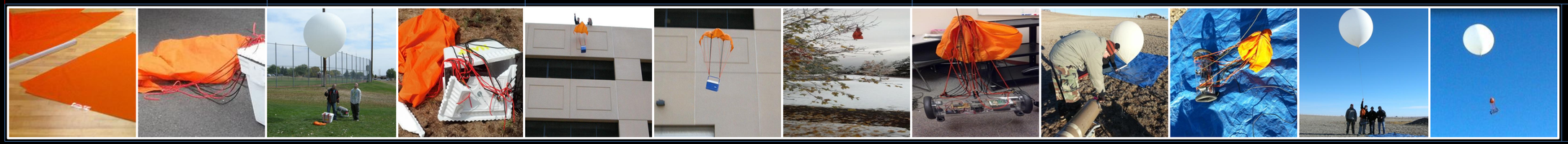
• Integrate Gen1 and Gen2 hardware and software components
• Launch the HARP payload with a calculated maximum AGL of 120k feet
• Retrieve the high altitude vehicle within one square mile of targeted landing site

Results:

As of 2/14/2013 the team has not had favorable conditions to attempt a high altitude launch. In addition, one of the team members is preparing for deployment to Afghanistan, so team HARP will make its final high altitude launch when all are present.

07/09/12 — 02/20/13

Parachute Fabricated	Tethered Drop Test	Parachute Drop Test	Flight



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