BalloonSat 37 Flight Report
Launch: Saturday, October 4, 2014 8:40 PM
Research Park 34.73247 N, 86.69525 W

OVERVIEW:

BalloonSat 37 was a success! This series of two consecutive balloon flights, BalloonSats 37.1 and 37.2, served as the primary flight opportunity for the One Month Training projects. In the span of one month, new members of the Space Hardware Club formed four-person teams which each designed and built a balloon payload with a mission to measure altitude, blink LEDs to communicate the state of the onboard flight software, and perform a controlled descent after autonomously releasing from the balloon.

A total of thirteen One Month Training payloads were flown, seven of which fully completed the mission! A master-cut-down payload was flown on each balloon as a backup in the event that any of the One Month Training payloads failed to release from the balloon. SPOT and Amateur Radio trackers were also flown on each balloon.

On Flight 37.1, the master-cut-down payload failed, committing the trackers and two of the One Month Training payloads to a high altitude flight profile. This flight was tracked to northern Georgia and recovered on Thursday, October 9. On Flight 37.2, the master-cut-down payload performed nominally, bringing down all of its payloads within Research Park.

In addition to approximately fifty members of the Space Hardware Club team, visitors were present. During the UAH Open House earlier in the day, the Space Hardware Club had the opportunity to present our work to prospective students. We invited these students and their families to join us for the evening launch, and several were able to attend!

For more information regarding BalloonSat efforts of the UAH Space Hardware Club (SHC), please visit our BalloonSat webpage at space.uah.edu/balloonsat. Our dedicated team actively conducts BalloonSat missions year-round.

PAYLOAD MANIFEST (Flight 37.1):
The following payloads are listed sequentially from the balloon downwards.

- 1600 gram Hwoyee Balloon
- Main Parachute
- Master Cut-down Device
  - Releases all remaining payloads after nominal deployment window for One Month Challenge payloads
- Automatic Packet Reporting System (APRS) beacon (Byonics Micro-Trak AIO)
  - Callsign: K4UAH
  - Frequency: 144.390MHz
• SPOT Tracker
• One Month Challenge Payloads (x6)
  o Each payload:
    ▪ Measures Altitude
    ▪ Releases from the balloon at 750 feet
    ▪ Includes LED Blinkers

**PAYLOAD MANIFEST (Flight 37.2):**
The following payloads are listed sequentially from the balloon downwards.
• 1600 gram Hwoyee Balloon
• Main Parachute
• Master Cut-down Device
  o Releases all remaining payloads after nominal deployment window for One Month Challenge payloads
• Go-Pro camera facing downwards
• Automatic Packet Reporting System (APRS) beacon (Byonics Micro-Trak AIO)
  o Callsign: K4UAH
  o Frequency: 144.390MHz
• SPOT Tracker
• One Month Challenge Payloads (x7)
  o Each payload:
    ▪ Measures Altitude
    ▪ Releases from the balloon at 750 feet
    ▪ Includes LED Blinkers

**LAUNCH:**

The team assembled at UAH for a pre-flight briefing at 5:45 PM. Supplies had been loaded beforehand into a team member’s trailer. The team re-assembled at 7:00 PM at the launch site by Explorer Blvd. in Research Park. The fill team inflated the two balloons sequentially, while the One Month Training teams secured their payloads to the main ropes attached to the balloons. The tracking team powered up the trackers and verified reception by both our mobile ground station and our ground station in the Space Communications Lab at UAH (EB 273).

Liftoff of the first balloon (Flight 37.1) was initially planned for 8:00 PM. Difficulties with the master-cut-down payloads delayed liftoff of the first flight until 8:40 PM, with the second (Flight 37.2) following several minutes later. Just as the second flight lifted off, one of the One Month Challenge payloads prematurely released from the payload line. The other payloads began the ascent.

**FLIGHT:**

Flight 37.1 lifted off into a mild wind which carried it slowly to the southeast over fields in the center of Research Park. After four of the One Month Training payloads successfully released from the balloon near their target altitude of 750 feet above ground, the balloon continued to ascend. The master-cut-down payload should have released all the remaining payloads from the balloon near 1500 feet above ground. The master-cut-down payload failed, causing the remaining payloads to ascend into
the stratosphere to an altitude near 100,000 feet. The balloon burst over Fort Payne, AL, at which point the main parachute inflated to control the descent. The payloads landed in rural northern Georgia at coordinates 34.25903 N, 84.96259 W. The flight profile below was plotted from data received in the Space Communications Lab operated by the Space Hardware Club at UAH (EB 273).

Flight 37.2 followed a similar initial flight path, travelling to the southeast over Research Park. Three of the One Month Training payloads successfully released from the balloon near their target altitude of 750 feet above ground, after which they descended into the fields of central Research Park. The master-cut-down payload released all of the remaining payloads near an altitude of 1500 feet above ground.

**RECOVERY:**

Landing within Research Park were all payloads from Flight 37.2, along with the four One Month Training payloads which nominally released from Flight 37.1. Directly after the flight, the team began searching for the payloads through the fields of central Research Park, aided by blinking LEDs on each of the payloads. Of the seven One Month Training payloads which successfully released from the balloons at an altitude of 750 feet above ground, five were successfully recovered. Also recovered in Research Park shortly after the flight were the trackers and remaining One Month payloads which were released from Flight 37.2 by its master-cut-down payload.

Tracking data from Flight 37.1 revealed that the landing location in rural northern Georgia was safely away from roads and buildings. An immediate recovery effort that night was therefore deemed unnecessary. The landing location turned out to be a hunting property owned by a local resort. The land manager contacted the team early the next week by calling the phone number posted on the payloads. The payloads landed clear of trees, and the land manager picked them up and held them for us. On Thursday Oct. 9, two members of the team made the drive to pick up the payloads, concluding BalloonSat 37.
FAILURE ANALYSIS: Master-Cut-Down Device, Flight 37.1

The master-cut-down devices function by briefly activating an electrical heating element (hot-wire) in order to cut a link between the payloads and balloon made of 50-pound-test plastic monofilament fishing line. The heating element of the master-cut-down device on Flight 37.1 was disconnected during the flight, causing failure. The connecting wire between the heating element and control circuitry was made too short. As the weight of the payloads pulled against the master-cut-down device, this connecting wire was pulled taught, severing the connection. This problem was avoided on Flight 37.2 by using an adequately long connecting wire. The problem could have been avoided by more thorough testing of the payloads before the flight. This was a valuable lesson for the Space Hardware Club ballooning team.

PHOTOS: