

Abstract

We present the successful high-altitude balloon system developed and used by Gannon University for August 21, 2017 Solar Eclipse. Gannon University, along with a nationwide network of collegiate teams sent payloads to an altitude of ~24 kilometers to capture and stream video footage and still-image shots of the eclipse and to track the path of the balloon.

On The Ground



Figure 1. Ground Station and Tracking Vehicle Laptops

o Ground Station

- Three Antennas
 - 1) Patch Antenna for Still Image
 - 2) Yagi Antenna for Still Image
 - 3) Dish Antenna for Video
- One Laptop
 - 1) Control Ground Station
 - 2) Stream Video

o Tracking Vehicles

- One Laptop for Map Displays
- Two Antennas
 - 1) RF Antenna for Tracking
 - 2) GPS for Navigation

Payloads

Video payload is equipped with eight cameras controlled by Raspberry Pi to ensure constant 360° view. RF payload tracks balloon via GPS transmitted using RF antenna and Cell Phone with AccuTracking. Still Image payload contains pi camera for still image photos and Iridium tracker. Cut Down payload cuts string to balloon based on emailed commands to the Iridium in the Still Image payload and transmitted to the Cut Down payload using ZigBee Protocol.

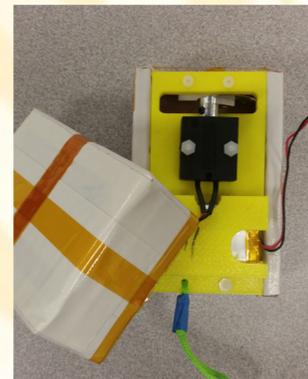


Figure 2. Video Payload

Figure 3. RF Payload

Figure 4. Still Image Payload

Figure 5. Cut Down Payload

Preparation Week

Preparations began Monday August 14, 2017. Payloads were tested and assembled in the lab and field tested through tethered launch and automobile tracking exercises.



Figure 6. Practice Launch System Testing



Figure 7. Tethered Launch



Figure 8. Tracking Vehicle Testing

The Road To Kentucky

The Gannon team traveled from Erie Pennsylvania to Cadiz Kentucky to capture the solar eclipse. Four helium tanks were picked up from the University of Kentucky and loaded onto the bed of a truck. The team also ran flight predictions to map out possible locations where the balloon might land.



Figure 9. Loaded Vehicle



Figure 10. Driving Through Kentucky

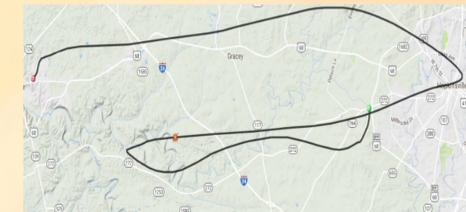


Figure 11. Flight Path Prediction

Solar Eclipse August 21, 2017

On Eclipse Day, the launch site was prepared at Trigg County High School in Cadiz Kentucky. After running pre-flight tests, the 2,000g balloon was filled with 200 cubic feet of helium gas. The payloads were tied to the balloon, and the balloon was launched. Video captured by the payloads was transmitted to the ground station and livestreamed from a laptop.



Figure 12. Filling Balloon



Figure 13. Launching Balloon



Figure 14. Streaming



Figure 15. Eclipse