University of Southern Indiana's Solar Eclipse Experience

Adam S. Lockard, Ryan Loehrlein, Colin Runnion
Glen Kissel, Faculty Advisor
University of Southern Indiana, Evansville, IN

Abstract

The University of Southern Indiana Eclipse Ballooning team's experience from May 2016 to August 2017 is comprehensively reviewed. Experience gained during rehearsal balloon flights is covered, including the need to coordinate with a pre-Senior Design class assisting in three of the flights. Challenges encountered were: learning ballooning techniques, reconfiguring the pod stack, adding new hardware, like a grounding rod and a 3D printed standoff, losing tracking visibility due to server crashes at the Borealis hub, and making quick software turnarounds. The students found the networking afforded by the entire experience to be one of the highlights of the project.

Workshop "Beta Testers"

- Workshop lasted 5 days at Montana State University (MSU), in May 2016. Our group was at the Pre-Workshop with several other teams.
- The team consists of an electrical, mechanical, and mechatronics engineering major. The team was developed without any of the members knowing each other.
- During the workshop the team assembled three pods (Still Image, Video, and Iridium) and the tracking Ground Station, while learning the operating procedures.
- After the workshop at MSU was completed the team had an opportunity presented by Dr. Kissel to go to Yellowstone National Park.

Lessons Learned - Take Away

- Through the process the team gained interpersonal communication skills by networking with other Eclipse teams.
- The process allowed the team members to understand what a engineering project consisted of.
- Time management skills were acquired during the numerous launches – given the project was during semesters and due to normal logistical/communication problems.
- Learning how to troubleshoot a problem and rapidly coming up with a solution in the field.

Eclipse Day (August 21st 2017)

- Pod Stack
  - Same pod stack as used on the National Dry Run Day.
- Flight Specifics
  - The GS and launch site were 5 miles apart.
  - The GS utilized the WiFi extender.
  - At the GS there were multiple computers running the software.
- Results
  - The team had live video until the WiFi extender was unplugged from the Ethernet connection
  - The tracking was fully functional
  - No images were transmitted







First Flight (August 27th, 2016)

- Pod stack
  - Iridium and Video (in one pod)
  - Still Image| - APRS
- Flight Specifics
  - This was the first flight with the entire system, as well as our first flight as a team.
  - The Ground Station was located at the launch site near a building and power lines were above
- Results
  - Video connection lasted until ~20,000 feet and we obtained pictures during the entire flight.
  - We believe the Iridium and video antennae caused interference – which resulted in no video.

Second Flight (October 22nd , 2016)

- Pod stack
  - Iridium | - Video
  - Still Image| - CubeSat Prototype
  - APRS
- Flight Specifics
  - The Ground Support software Spyder didn't appear due to a Windows 10 update, which caused properties to change.
  - Ground station was located within a 20 mile radius of launch site.
  - Attached the grounding rod to the dish antenna.
- Results
  - MSU server crashed – caused intermittent tracking
  - We had to hand track the balloon because Spyder had failed

Third Flight (April 1st , 2017)

- Pod stack
  - Iridium | - Video
  - Still Image| - CubeSat Prototype
  - APRS
- Flight Specifics
  - Adam manually started the video streaming software by SSH into the PI.
  - The Ground Station team utilized a WiFi extender instead of hard connection,
  - Cut-down was not used on this flight
- Results
  - We had RFD lock the entire flight, but no images were transmitted
  - No video was obtained in this flight

National Dry Run (June 20th 2017)

- Pod stack
  - Iridium | - Video
  - Still Image| - APRS
- Flight Specifics
  - All 53 teams across the US tested their pod setup.
  - MSU sent a software update for the Ground Station (GS) two weeks before the National Dry Run.
  - The server crashed at MSU.
- Results
  - Team members nearly caught the balloon at the landing site.
  - The GS would spin 180 degrees randomly through the flight due to software errors.

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