

## GreenCube 3 Lessons Learned

### Notes from the launch team

- moon down!!!
- DNT/zigbee radios need a clear field of view to work (keep the computers out of the way)
  - recovery team – go to the top of a hill
- notes for reordering the countdown:
  - ELT turn-on first?
  - when to start data recording
  - which balloon to fill first
  - when to start telescope tracking
- tracker program
  - limits?
  - write to files, display while running
  - predictor-corrector slew
  - executable or python instead of matlab
  - errors
- analysis of telescope data
  - brightness of observed stars
  - identify actual sightings
  - CCD data handling (ask Yorke)
- K111 data – still need to evaluate:
  - magnetometer and accelerometer spin rates
  - thermistor inside payload
  - camera data
- GPS tracks night vs day
- GPS tracks Fred vs Henry
- improve ham radio turn-on? mirror?
- ICD needs to be updated
- balloon tie-off: use plug and hose clamps instead of tying a knot
- LED circuit mechanical layout: gerberize?
- add to top of checklist: all computers in non-sleep mode
- in realterm: record and display files (both launch and recovery)
- car situation for recovery team isn't working
- no tape in the wet!
- long extension cords are a very good idea!
- get a bigger tarp
- make a checklist for recovery team

## Notes from the recovery team

- Consider using one car with 4 people for recovery team
- develop protocols for actions when payloads land in trees, water, private property, etc.
- car camp near to the touchdown site so the recovery team gets a decent night's sleep for night launches
- bring lots of caffeine
- have a full practice for ELT direction finding equipment
- consider a beginner's flight to train new lab members
- Develop a safety perspective. Being safe is the first priority when finding the payloads.
- Develop better on-the-fly plotting of payload locations on a map.
- Issues to investigate: KeyRingers, DNT radios, BallTrack prediction software
- in the BallTrack prediction software: if descent rate and burst altitude are unknown, make lots of predictions using different parameters.
- all vehicles should be SUV sized or larger
- greencube members should get vox certified
- recovery team should have at least two functioning handheld GPSs.
- zigbee won't work in a faraday cage – don't put it in the car
- buy a magnetic mount antenna for the zigbee?
- ELT antennas are not flexible – we should get flexible ones.
- talk to the land owner if our payload is in a tree more than 15 feet high, in a tree we can't climb, or we can't snag it.
- bring rope to throw up into trees to snag payloads
- field test the ELT direction finding system. Hide an ELT somewhere near campus and give the recovery team simulated last known GPS positions
- unresolved problem with VX-3R
- cache data onboard the payloads in a USB thumb drive
- stick to the timeline in the MRR which begins 3 days before launch
- purchase a 3G device internet data plan for the field
- Have well defined (i.e. with numbers!) minimum and comprehensive criteria and launch/recovery requirements (ex. moon light, % cloud cover, wind speed, fog etc).
- Unless the prediction software becomes accurate again (and we can trust it), I think the recovery team needs to be about 4/5th along the predicted flight path and ready to move to stay under the payload to receive positions from the payloads.
- Split up the jobs. Have more people involved in watching the data. Assign tasks. If the Ziggy data belonged to someone - we would have got it.
- Our plans should be flexible enough to handle other weather during recovery. Snow covered roads, rain storms, etc. I realize we don't launch during bad weather, but things can change.
- We should have a clear delineation of who is the Incident Commander – who (or what number) gets the update phone calls and who we call for further instructions or guidance.
- making firm decisions for good reasons is a good thing.