High Altitude Balloon Mission

CCARC General Meeting - 7 May 2021

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Overview

- Identify participants
- Special safety consideration
- Overview of payload technology
- Operation and development team structure
- Video from Nashua Radio Club Launch

Who is interested

- Stem students and teachers
  - Physics, Weather, Environment
  - Web stream the event
  - Students work with Amateurs to develop the payload for the mission
  - Be part of the operational teams
- Amateur operators
- Served agencies
- General public

Generate interest in getting licensed

- See amateur radio in operation
  - Repeater operation and simplex
  - APRS
  - ATV
  - Mobile and fixed station
  - GPS
- Advancing science and technology
- Using science to analyze flight and technology

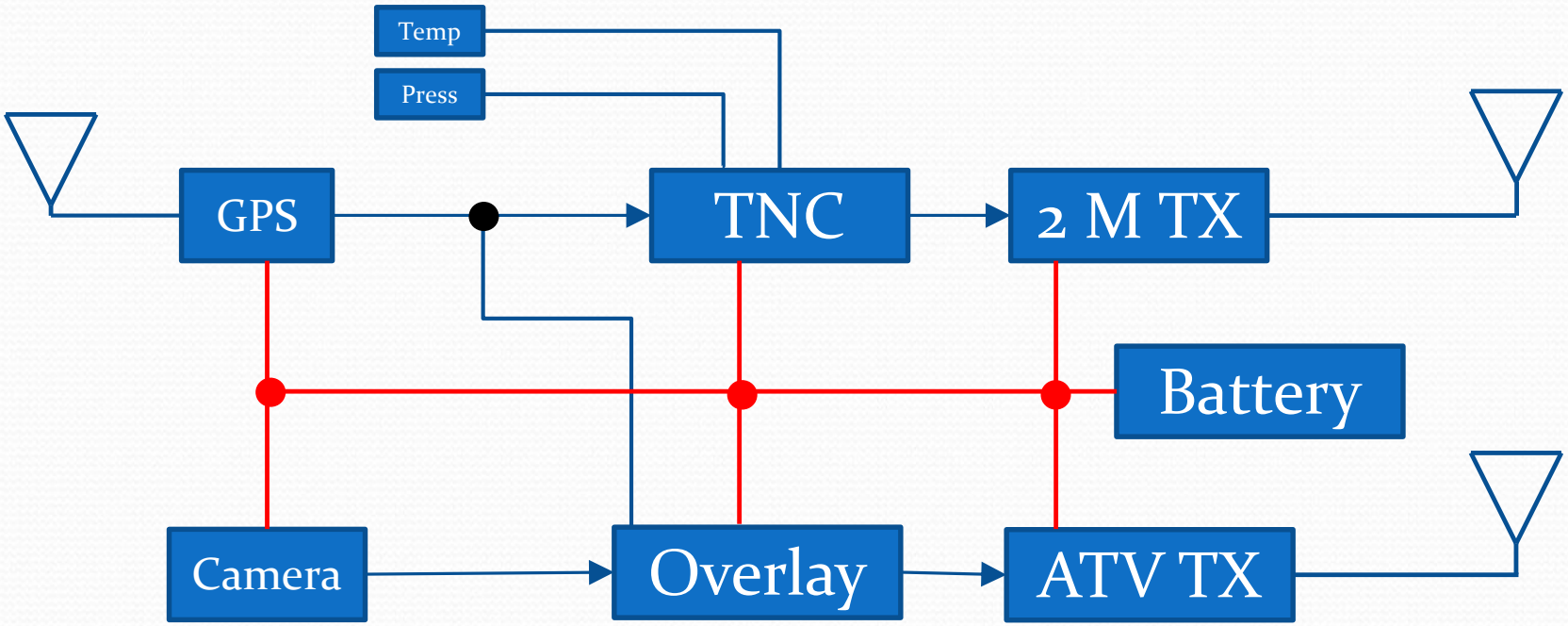
Special Safety Consideration

- The density of the payload must be low enough that a collision with an aircraft will do minimum damage
- Notify authorities of launch
- Tracking payload for recovery and permission to recover
- Expected track of balloon and payload
- Max foot print of signal (400 mile radius)

Payload

- GPS enabled for high altitude
  - (for legal and defense reasons most GPS do not work over 10K ft)
- APRS transmitter
- ATV camera and ATV transmitter (cable channel 39)
- Pressure and temperature sensors
- Packaging
- Wind stabilized
- Abort mechanism

Block diagram



Basic specifications

- 2 Watt ATV
- Mini TNC without case
- 5 Watt 2 meter TX
- High altitude GPS Motorola
- 19 inch 2 meter wire antenna
- 70 cm horizontal loop antenna
- 6 amp hour 12 volt battery (1.5 lbs)
- All bare boards housed in thin brass cases
- Styrofoam encloser

Operation and development

- Making the payload light
- Battery budget to last 4 hours (batteries are heavy)
- Insulation from cold but ventilated to prevent heat build up
- Assembly of payload
- Parachutes for descent
- Balloon and helium for ascent

Mission planning

- Track high altitude winds to predict path and distance
- Calculate balloon buoyancy for correct rate of rise
- Actual fight should take 2 hours
- Notify all appropriate agencies of expected flight path
- Organize each team
  - Mission control
  - Launch team
  - Recovery team

Event teams

- Launch team
  - Final assembly and test of payload
  - Layout balloon, parachute, and helium
- Operations
  - Main net control
  - Receiving APRS and video stream
- Recovery
  - Tracking APRS
  - Mapping and mobile teams

Operation team

- Setup at good radio location with access to internet
- Path prediction team with latest jet stream forcast
- Make sure all receivers are ready for payload reception
  - This can be a remote site or amateur location
  - Local receivers at launch to insure systems are working
- Coordinate media releases
- Confirm recovery teams are in place
- Communicate with launch site and confirm to launch

Launch team

- Prepare site
- Use latex glove when handling balloon
- Set up safe inflations site with wind breaks as needed
- Payload test team
  - Make sure all gps-aprs-atv-sensors working
  - Final assemble with camera positioned

Recovery team

- Travel path can be 50-400 miles
- Have teams prepositioned along expected paths
- All teams should have mobile receivers for both ATV and APRS
- Addition RDIF equipment for recovery teams
- Trained all members in proper protocol for permission to recover from private land

Nashua Radio Club Launch

- 12 min video that give a great overview
- HAB-2 Launch This Saturday - How To Track Our High-Altitude Balloon (n1fd.org)

Cost

- Payload should be considered expendable $600.00
  - Most times it can be recovered but not always.
- Helium $150-$600
- Balloon $130.00