

Project CODENAME

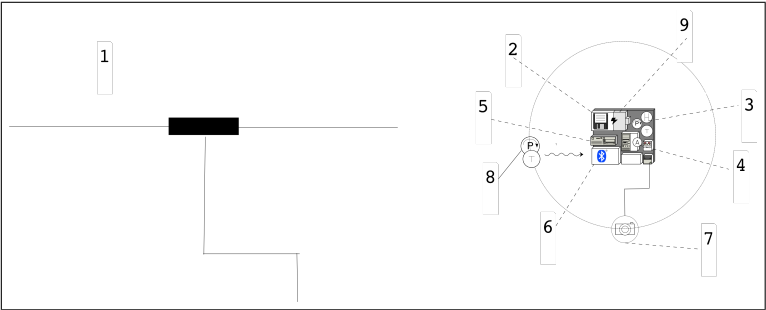
The Project CODENAME payload is equipped to collect internal and external temperature and pressure data, location, accelerometer and humidity measurements as well as photographs at short intervals for the duration of the balloon flight. This data will be written to a MicroSD Card which can be read upon retrieval of the capsule, and all information except for live video will also be transmitted in real-time to a ground station via APRS. The Project CODENAME payload is equipped with a secondary GPS (and transmitter) that runs on a separate power source to ensure location redundancy. The projected weight for the payload is 210 grams, and the projected price is less than \$750. Maximum battery life of the payload operating at maximum expenditure is approximately 22 hours.

Primary Advantages

The combined chipset and program employed by Project CODENAME gives the payload several thousand times the processing power of a raspberry pi on significantly less battery power. The direct integration of storage and sensors on the circuit board means the payload is much faster and more efficient than any other processor. The program written by Project CODENAME allows for all sensor data to be transmitted almost continuously (without violating APRS fair use rules) and also potentially to transmit photographs in real-time. The configuration of the chipset would also allow for seamless integration of additional sensors; any existing scientific equipment could be attached to the payload with minimal effort, weight allowing. The independent nature of the external sensors also means that the working components of the payload could be situated on a gyroscope, ensuring payload safety in all conditions (this is not reflected in the memo design due to time constraints). Each of these advantages is explored in more detail in this memo.

Hardware

The payload will be run by a chipset taken from a Samsung Galaxy S4. A version of this chipset has already been acquired and tested extensively by Project Codename.



1. **APRS Transmitter** Leverages existing radio relays to keep payload in constant contact after takeoff; will send all sensor data to ground station in real-time; also equipped with GPS capable of high altitude positioning
2. **MicroSD Card** Storage capacity of 256GB (3 million photos or 33 hours of HD video) All sensor data will be saved to this, including live video and photographs
3. **Internal Sensors** Pressure, temperature, and humidity: Data collected from these sensors is written onto the MicroSD Card AND sent to the ground in real-time via the APRS transmitter
4. **Accelerometer** Data from the accelerometer is also written to the MicroSD card and sent to the ground continuously via APRS
5. **GPS** Secondary GPS on separate power source, provides 100% location redundancy
6. **Bluetooth Transmitter** Power consumption by transmitter almost negligible; transmission does not interfere with APRS
7. **External Camera** 13MP Live video and photographs written to MicroSD Card; possibility of transmitting photos in real-time via digital APRS band
8. **External Sensors** Pressure and temperature: These sensors transmit to the chipset via bluetooth; this data is written to the MicroSD card and sent to ground in real-time via APRS
9. **Extended Density Lithium Ion Battery** 22 hour projected life
10. **PLEASE NOTE** The nature of this chipset is such that any existing scientific instrument can be added to the payload with minimal effort, weight allowing.

Software

The Project CODENAME team has already written and tested a comprehensive operational script for the payload. By serializing all data sent by APRS, the payload is able to transmit 2 times the amount of data of typical APRS systems, with less power consumption. The program is also written to run natively on a rooted chipset, reducing power consumption even further.

Ground Station

Project CODENAME has two independent methods for predicting weather patterns and balloon flight path, both of which have been proven effective in the field. The team also has direct ties to the Office of Congresswoman Kristi Noem, which will simplify negotiations with the FAA tremendously.