**Command Module**

The CMD, or Command Module, is the main tracking and telemetry system for the

Balloon Payload Program. For this launch, it has been redesigned into its fifth version,

improving and enhancing all of the three major payload subsystems: electronics, structure, and

power. Among the new electronic features are a cellular GPS system for enhanced low altitude

tracking and a set of more reliable and precise radio transmitters for broadcasting GPS tracking

information to the waiting ground stations. In terms of structure, the CMD has adopted a unique

multi-shell design. This shell begins with a 3d printed, PLA plastic container for both insulation

and impact protection of all electronic components. Moving outward, the next shell is a 3d

printed ABS shelf container, allowing for a varied electronics containers to be utilized, depending

on the necessities of the flight. The outer shell is first a layer of high R-value EPS insulation

foam for thermal protection and impact energy dissipation, and then a harness made of a

ballistic-grade of nylon, for attaching the payload to the balloon string. Finally, the power

systems will now utilize lithium polymer batteries, which carry higher energy density then the

previous batteries in addition to being rechargeable, so as to reduce waste. These batteries are

regulated by custom circuitry mounted inside the innermost shell of the structure.

**SpaceQube**

The SpaceQube is a an experiment to construct an adiabatic flight chamber, producing a

high resolution map of control volume temperature variation during operation and acting as a

platform for other, thermally sensitive experiments once the concept has been proven.

**Host**

Host payload is a testbed for the use of advanced materials and manufacturing processes in payload construction, provides high resolution video throughout the flight, and is also testing a new generation of electronics called Balloonduino. In addition to providing valuable engineering data on the operation of these electronics and materials in the harsh environmental conditions encountered, Host payload will be the first payload of the Balloon Attitude Determination and Stabilization System, slated to fly next semester and provide stabilization during the rigorous motion of balloon flight.

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**XBee**

XBee's, a miniature short range radio module, are employed to enable payload-to-payload communication in flight. Our payloads utilize them to send science and engineering data between payloads, reducing the redundancy required by allowing payloads to share sensors, providing most robust data logging capabilities by allowing multiple payloads to log data, and allowing real time telemetry from all payloads in conjunction with the 900MHz radios in white box and the tracking software in the vans.