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APPLICATIONS OF PARAGLIDER-HIGH ALTITUDE BALLOON TELEMETRY FOR SUCCESSFUL SECONDARY STUDENT CUBESAT MISSIONS

Abstract

High Altitude Balloons (HABs) provide learning opportunities for students conducting CubeSat missions. HABs are large latex balloons filled with helium that can reach altitudes of 24,000 meters and collect data using sensors. They can be used for many types of research such as imagery, radio testing, submillimeter astronomy, and are being considered for telecommunications and tourism. HAB radio networks are similar to CubeSat communication networks, in that the data uses the same transmission network, data interface, and similar flight hardware. The Wolfpack CubeSat Development Team (WCDT) develops CubeSat and HAB missions. Typical HAB missions conducted by the WCDT include a 1200 g high altitude weather balloon, 30 ft in diameter and the ability to carry a payload of 4.6 lbs. The payload consists of a 5.8 GHz EyeStar radio transmitter, 900 MHz video camera, battery packs, air and water temperature sensors, GPS, vertical accelerometer, and a buoy. Frequently, HAB flight paths end with the mission destroyed after the balloon bursts. The payload inside the sealed buoy, however, continues to transmit data for up to a week, depending on battery levels. The WCDT Students will use a paraglider to simplify the recovery of the HAB payload to an easily accessible location. The HAB-Paraglider is designed to enable a team to retrieve their HAB mission. The paraglider will steer the HAB to its launch site. This will allow teams to recover their experiment to either do further research, or to save money by reusing materials. Students use the HAB payload hardware, digital dashboard with sensor data and global tracking as preparation for conducting CubeSat missions. The EyeStar radio transmits to the Globalstar network of satellites. Data relayed from WCDT HABs or CubeSats is transmitted to the Globalstar network and then relayed to the ground where students access it through a unique dashboard operated by

NearSpace Launch, Inc. The dashboard allows students to select, highlight, zoom in, and download the telemetry. This simplification of data transmission and reception enhances the student learning experience by allowing them to (a) Focus on experimental data related to flight parameters (altitude, latitude, longitude, ascent rate, horizontal speed, etc.), payload parameters (battery voltage levels, packet losses, internal and external temperatures, etc.) and the flight video; and (b) Proper analysis of the raw data from these missions. This HAB experience ultimately prepares students to optimally design, build, test, and launch CubeSats into space.