High-Altitude Research Platform (HARP): Modular Payload System for High Altitude Balloon Experiments for K-12 Outreach

The High-Altitude Research Platform (HARP) is intended to be a cheaper alternative for scientific research in high-altitude, low pressure, low temperature, and high radiation environments. It is a next best scenario to launching a package with a major organization such as NASA or SpaceX into space. HARP uses a high-altitude balloon to carry a payload to an altitude between 100,000 ft and 120,000 ft, where the environment is similar to that of the surface of Mars and a ground station that tracks the payload during the flight and transmits data to and from the payload. It has modular bays for multiple experiments to be loaded and flown together. HARP has two payloads. One payload houses the main flight systems with various sensors, GPS, Iridium, APRS, cameras, telemetry systems, and wireless communication system. Second payload houses up to eight experimental payloads. Each launch costs about $500, which includes consumables (gas, balloon, etc.) and travel for the chase team to recover the payloads. Each experimental payload is designed to be self-contained. Each of the experiments connect to main flight system using a wireless communication system. This prevents one malfunctioning experiment to affect other experimental payloads or the main flight systems. We provide K-12 schools and other researchers the base system which include all necessary hardware and software to connect and interact with the main flight systems. The experiments can be shipped to us to be scheduled and flown on upcoming missions. The modularity and wireless communication allows for flexibility and reliability while still providing access to basic sensor and telemetry information from main flight system and also real-time communication with your experiments. This project dramatically improved our capabilities in high-altitude ballooning program and will provide phenomenal STEM education opportunities; not only for our students but also to students at all levels across the country.