

Preparation of the Kentucky Re-Entry Universal Payload System for Orbital Flight.

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The design of an efficient Thermal Protection System (TPS) remains one of the most challenging aspects of planetary exploration missions. Because of the uniqueness of atmospheric entry environments, ground facilities cannot accurately replicate these conditions. Consequently, scientists must rely on numerical models that often lack flight validation. In order to provide an inexpensive means of obtaining flight data, an adaptable testbed for scientific experimentation has been developed at the University of Kentucky with initial focus in TPS design. This vehicle is the Kentucky Re-entry Universal Payload System (KRUPS).

As a technology maturation step, two sub-orbital missions were conducted on sounding rocket flights, KRUPS Deployment and Communication System (KUDOS) and KRUPS Operational Reentry Experiment with Veterinary Aspects (KOREVET). The primary goals of these missions were to demonstrate capabilities of the spacecraft and ejection mechanism in relevant environment. A stratospheric balloon flight along with a third sounding rocket flight are to be conducted in May and August 2019 respectively. The goals of these upcoming missions are to demonstrate readiness for performing an upcoming orbital flight from the International Space Station by demonstrating data acquisition, communication, vehicle recovery, and TPS designs.

The end goal of the KRUPS project is to conduct an orbital mission with a fleet of these spacecraft to obtain a data bank that can be used to reliably verify modeling of TPS design. In order to do so the KRUPS capsule must be proven reliable thus making the intermediate flights critical to project success.



Figure 1: Video footage obtained during KOREVET



Figure 2: Video footage obtained during KUDOS