**Adaptive Deployable Entry Placement Technology (ADEPT) Development for Small Sat Class Venus Missions**

**Background and Goal**

The Adaptable, Deployable Entry and Placement Technology (ADEPT) is a novel approach for entry vehicle design. Similar to an umbrella, it is stowed during launch and deployed prior to entry. ADEPT employs a high performance, 3D-woven carbon fabric to serve as the primary surface of the mechanically deployed system. The successful ADEPT sounding rocket flight test matured the 1m Class ADEPT in the areas of deployment and structural integrity, and provided aerodynamic flight characteristics of the ADEPT open-back configuration from Mach 3 to Mach 0.3.

Aerocapture uses the aerodynamic drag from a single hyperbolic atmospheric pass to provide the delta-V needed for orbit insertion. Studies suggest that, compared to propulsive orbit insertion, aerocapture could increase delivered payload by 70% at Venus. Drag modulation aerocapture, which shows promise of being simpler and more cost-effective than the more-often studied lift modulation methods, uses in-flight transformations of an entry vehicle’s drag area to control the amount of deceleration produced during an atmospheric pass. In single-event drag modulation, a drag device is jettisoned after the appropriate deceleration. ADEPT, due to its unique ability to fold and unfold, is being considered for this SmallSat class payload mission applications.

**Performance Parameter**

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**Results Summary**

- KPP-1: Project goal met- Desired aerodynamic shape all the way to the ground
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- ADEPT SR-1 was dynamically stable through M=0.8
- The vehicle and all data products stored onboard the vehicle were recovered
- Increase in roll rate prior to encountering transonic flow was unexpected

**Sub-Orbital Flight Test Description**

**Predicted Timeline**

**In-Flight Still Frames from GoPro Video Cameras**

**Recovery Operations in White Sands Missile Range**

**Preliminary Post-Flight Reconstruction**

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**Drag Skirt Separation in Ballistic Range Flight: M = 11.5**

**System Level Aerothermal Ground Testing**

**Venus Aerothermal Conditions Achievable**

- Test conditions for Venus Entry conditions
- Advance interface materials and seals
- Characterize payload environments
- Improve thermal response design codes
- Evaluate lightweight structural ribs
- Assess novel 3d Spider weave manufacturing approach

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**ADEPT Future Work**

*Project Goal met—Desired aerodynamic shape all the way to the ground*

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