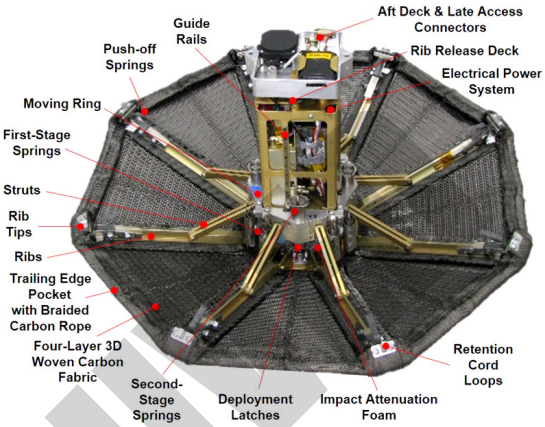
National Aeronautics and Space Administration

NASA**facts**

Space Technology
Game Changing Development
ADEPT SR-1 Flight Experiment

NASA's future missions will require ever-greater mass delivery capability in order to place scientifically significant instrument packages on distant bodies of interest, to facilitate sample returns from them, and to enable future human exploration of Mars. The Adaptable, Deployable Entry and Placement Technology Sounding Rocket 1 (ADEPT SR-1) project is developing a mechanically deployable low-ballistic coefficient aeroshell entry system to perform entry, descent and landing (EDL) functions for planetary missions.

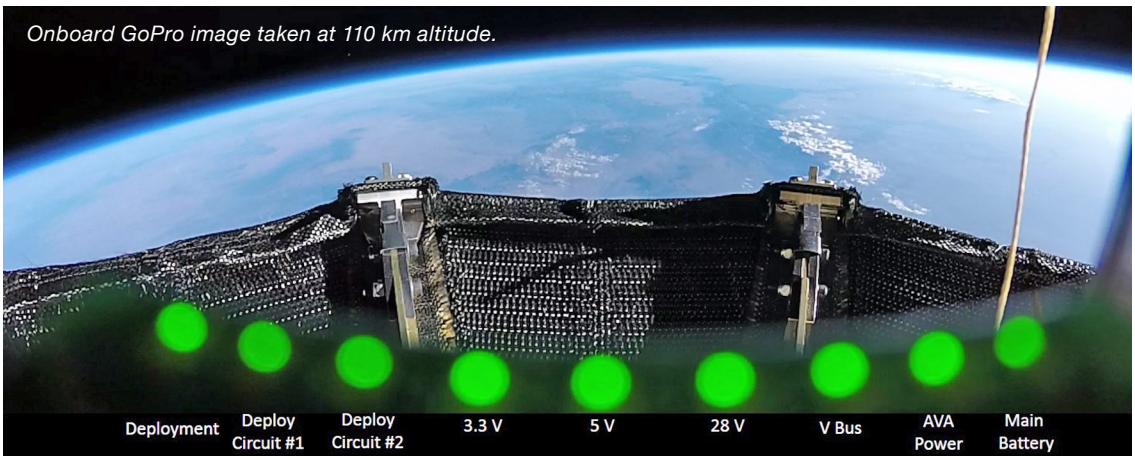
The ADEPT architecture represents a completely new approach for entry vehicle design using a high-performance carbon fabric to serve as the primary drag surface of the mechanically deployed decelerator and to protect the payload from hypersonic aerothermal heating during entry. The initial system-level development of the "nano-ADEPT" architecture will culminate in the launch of a 0.7-m deployed diameter ADEPT sounding rocket flight experiment. The SR-1 sounding rocket flight experiment is a critical milestone in the technology maturation plan for ADEPT and will generate performance data on in-space deployment and aerodynamic stability.



The ADEPT SR-1 flight vehicle.

The ADEPT project team is advancing this decelerator technology via systems-level testing at the 1-m diameter, or nano-ADEPT, scale. A subsonic aeroloads test and an arc-jet aeroheating test were completed in 2015. A successful SR-1 flight experiment brings the 1-m-class nano-ADEPT to technology readiness level (TRL) 5, achieving component or breadboard validation in a relevant environment.

Launch of the ADEPT SR-1 took place on September 12, 2018. The successful flight test used the NASA Flight Opportunities Program sounding rocket platform provided by



Onboard GoPro image taken at 110 km altitude.

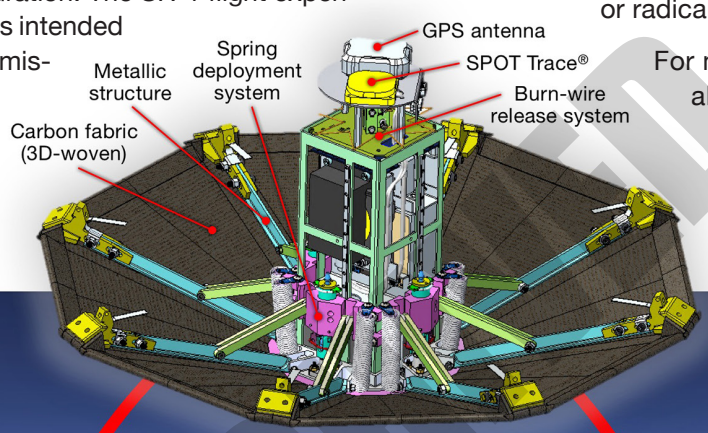
UP Aerospace to launch SR-1 to an apogee over 100 km and achieve reentry conditions with a peak velocity near Mach 3. The flight duration from launch to ground impact and recovery was approximately 15 minutes. The SR-1 flight experiment met its primary success criteria: demonstrate operability through end-to-end mission stages including launch in a stowed configuration, separation and deployment in exo-atmospheric conditions, and passive ballistic reentry of a 70-degree half-angle faceted cone geometry.

ADEPT SR-1 was truly experimental in the sense that it decelerated through the supersonic regime demonstrating aerodynamic stability of the unique ADEPT axisymmetric, blunt body shape with an open-back (no backshell) entry vehicle configuration. The SR-1 flight experiment utilized many features intended for 1-m scale space flight mission such as the carbon-fabric decelerator, two-stage spring system for deployment, and accommodating a payload geometry approximating a 3U CubeSat.

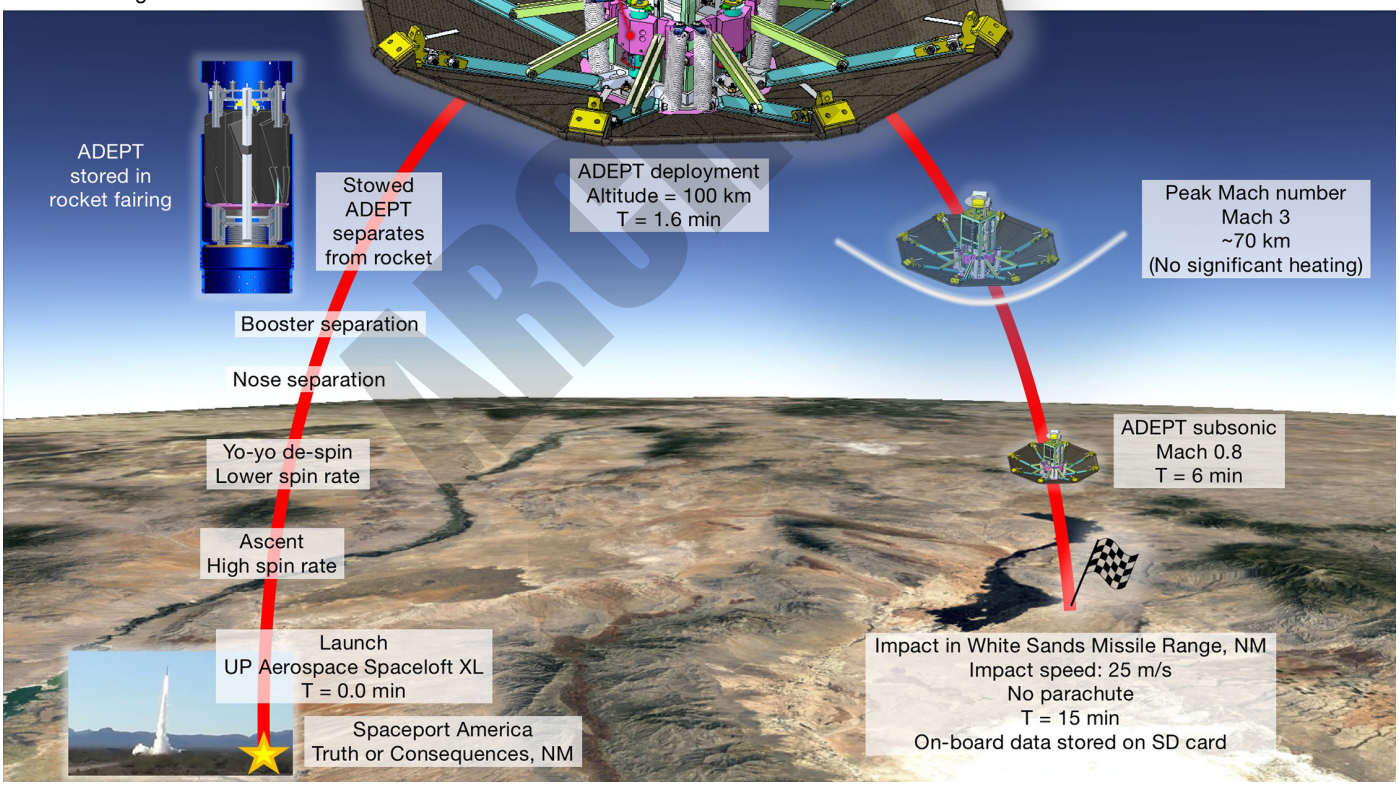
The design of SR-1 is focused on simple, robust solutions that are responsive to the flight experiment technical objectives while meeting the challenges of budget and schedule. After SR-1, the logical next step for the technology is an Earth reentry experiment from orbital velocities. Such an experiment would mature nano-ADEPT to TRL 6 for entry from low-Earth orbit and direct entry at Venus, Mars, and Titan.

The Game Changing Development (GCD) Program is part of NASA's Space Technology Mission Directorate. The GCD Program aims to advance exploratory concepts and deliver technology solutions that enable new capabilities or radically alter current approaches.

For more information about GCD, please visit http://gameon.nasa.gov



ADEPT landing scenario.



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Ames Research Center
Moffett Field, CA 94035

www.nasa.gov

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