

The F-TPS, which covers the inflatable structure and insulates it from the searing heat of atmospheric entry, can be separated into three functional layers: an exterior ceramic fiber cloth layer that can maintain integrity at surface temperatures in excess of 1600° C, protecting the underlying insulation from the aerodynamic shear forces; a middle layer of high-temperature insulators that inhibit heat transmission; and an interior impermeable gas barrier layer that prevents hot gas from reaching the inflatable structure.

HIAD technology has several other benefits over existing rigid technologies, including lower volume, lower total system weight and deceleration at higher altitudes than smaller area rigid heat shields. In addition, aeroshell size is scalable to fit missions with different payload mass requirements and launch vehicle fairing limitations. This mission flexibility provides new opportunities for robotic and human exploration missions previously deemed infeasible.

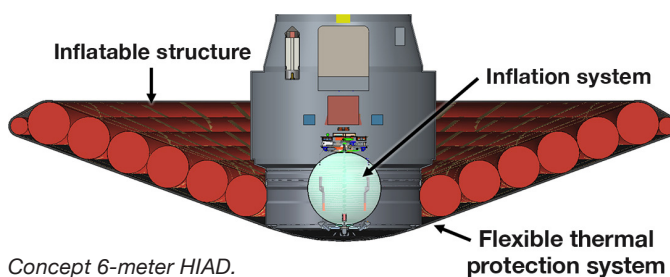
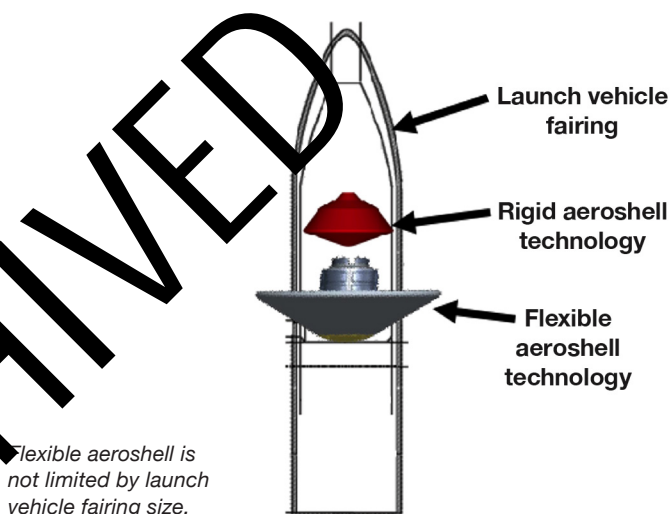
Since the beginning of its development in 2007, several ground-based advancements and two successful flight tests have provided a team of engineers at NASA Langley Research Center valuable data they have used to refine the HIAD technology. The Inflatable Reentry Vehicle Experiment 3, or IRVE-3, suborbital launch of a 300-kg payload to a height of 460 km on July 23, 2012, was the most recent HIAD test flight. The IRVE-3 flight test successfully demonstrated the ability of a HIAD to decelerate the payload from an entry speed of more than Mach 10 with drag forces approaching 20 g's. The IRVE-3 flight also demonstrated the ability to generate vehicle lift and stable flight through transonic and subsonic entry speeds.

Through iterative successes, HIAD technology continues to show great promise as a strong candidate for mission infusion, and is paving the way for future human access to Mars by challenging past conceptions of entry, decent and landing technologies.

The Game Changing Development (GCD) Program investigates ideas and approaches that could solve significant technological problems and revolutionize future space endeavors. GCD projects develop technologies through component and subsystem testing on Earth to prepare them for future use in space. GCD is part of NASA's Space Technology Mission Directorate.



Flexible thermal protection system.



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National Aeronautics and Space Administration
Langley Research Center
 Hampton, VA 23681

www.nasa.gov