

**The HIAD Orbital Flight Demonstration Instrumentation Suite.** G. T. Swanson<sup>1</sup>, B. P. Smith<sup>2</sup>, R. L. Akamine<sup>3</sup>, R. J. Bodkin<sup>3</sup> and F. M. Cheatwood<sup>3</sup>. <sup>1</sup>AMA Incorporated at NASA Ames Research Center, g.swanson@nasa.gov, <sup>2</sup>NASA Ames Research Center, <sup>3</sup>NASA Langley Research Center.

**Abstract:** NASA's Hypersonic Inflatable Aerodynamic Decelerator (HIAD) technology has been selected for a Technology Demonstration Mission under the Science and Technology Mission Directorate. HIADs are an enabling technology that can facilitate atmospheric entry of heavy payloads to planets such as Earth and Mars using a deployable aeroshell. The deployable nature of the HIAD technology allows it to overcome the size constraints imposed on current rigid aeroshell entry systems. This permits use of larger aeroshells resulting in increased entry system performance (e.g. higher payload mass and/or volume, higher landing altitude at Mars).

The Low Earth Orbit Flight Test of an Inflatable Decelerator (LOFTID) is currently scheduled for mid-2021. LOFTID will be launched out of Vandenberg Air Force Base as a secondary payload on an expendable launch vehicle. The flight test will employ a 6m diameter, 70° sphere-cone aeroshell and will provide invaluable high-energy orbital re-entry flight data. This data will be essential in supporting the HIAD team to mature the technology to diameters of 10m and greater. Aeroshells of this scale will address near-term commercial applications and potential future NASA missions.

LOFTID will incorporate an extensive instrumentation suite totaling over 150 science measurements. This will include thermocouples, heat flux sensors, IR cameras, and a radiometer to characterize the aeroheating environment and aeroshell thermal response. An inertial measurement unit (IMU), GPS, and flush air data system will be included in order to reconstruct the flown trajectory and aerodynamic characteristics. Loadcells will be used to measure the HIAD structural loading, and HD cameras will be mounted on the aft segment looking at the aeroshell to monitor structural response. In addition to the primary instrumentation suite, a new fiber optic sensing system will be used to measure nose temperatures as a technology demonstration. The LOFTID instrumentation suites leverages Agency-wide expertise, with hardware development occurring at Ames Research Center, Langley Research Center, Marshall Space Flight Center and Armstrong Flight Research Center.

This presentation will discuss the measurement objectives for the LOFTID mission, and the extensive instrumentation suite that has been selected to capture

the HIAD's performance during the high-energy orbital re-entry flight test.

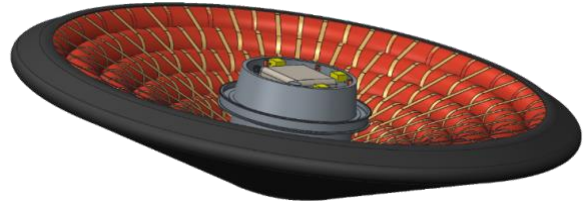


Fig 1. Drawing of the LOFTID 6m Re-entry Vehicle