

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Late breaking abstracts (LBA)

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THE LATEST ACTIVITIES AND INNOVATIONS FOR THE PARACHUTE-FREE LANDING  
ANALYSIS EFFORTS FOR MARS SAMPLE RETURN VEHICLE**Abstract**

The most recent developmental activities for a passively stable Earth Entry Vehicle (EEV) to safely return Martian samples to Earth are reported from the perspective of the past and current programs conducted through the CRashworthiness for Aerospace Structures and Hybrids (CRASH) Lab. The stable single-stage Entry, Descent, and Landing (EDL) EEV system relies on impact attenuation and the redirection of loads away from the Returnable Sample Tube Assemblies (RSTA) gathered by the Perseverance Rover. Publicly released deliverables from the CRASH Lab on National Aeronautics and Space Administration (NASA) and Jet Propulsion Laboratory (JPL) sponsored programs, which have played a significant role in the assessment, developmental directions, and broad acceptance of the Multi-Mission Earth Entry Vehicles (MMEEV), will be presented. Some of the works generated from such collaboration include topology optimization, system parameterization, high fidelity structural modeling for EEV subsystems, and analyses of mission-critical designs pursuant to Planetary Protection Protocols (PPP).