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**In-Orbit and Re-Entry Qualifcation of Hardware, Electronics, and Software by Neurospace: Insights from Artemis 2 and TEC Mission Possible Campaigns**

Qualifying rovers for lunar missions presents a unique set of challenges, often addressed through a combination of terrestrial and in-orbit testing. Traditional ground-based qualification methods fall short in replicating the harsh, dynamic conditions of space. To bridge this gap, we have adopted a dual-track strategy that includes in-orbit testing. But a single mission cannot capture the full spectrum of operational scenarios. To address this, we are participating in two upcoming in-orbit missions, each targeting distinct aspects of rover performance. The first, the Hemera experiment, focuses on electrical and mechanical validation, assessing critical subsystems under realistic operational loads. The second mission, the TACHELES satellite, will fly aboard the ARTEMIS II Space Launch System and concentrate on radiation effects, with a particular emphasis on single event effects (SEE). Together, these missions will provide essential data to refine satellite designs for future lunar exploration.

The Hemera Experiment evaluates three critical factors influencing component integrity: (1) the mechanical and acoustic loads experienced during a genuine rocket launch, (2) the combined radiation and vibration environment acting on individual electronic components, and (3) the impact of a deliberately harsh landing on the structural integrity of the hardware, including the subsequent assessment and required adjustments for post-flight recovery and data retrieval. This will be conducted through an orbital flight and re-entry test aboard The Exploration Company's Nyx capsule, which enables validation of hardware and mechanical interfaces subjected to dynamic mechanical loading, rapid thermal gradients, and splashdown shock environments. In this context, test articles include mechanisms, connectors, harnesses, and electronics intended for use in future deployable systems.

The TACHELES CubeSat will fly as a secondary payload on NASA's Artemis II mission via the Space Launch System through the Van Allen radiation belts. The University of Jena provided custom circuit boards with HiveR components (microcontroller) to detect single event effects (SEE). With this equipment, this experiment allows NEUROSPACE to gather a unique in-flight dataset that enables the reconstruction of the entire launch. The qualification campaign incorporates extensive pre-flight and in-flight testing of electrical, electronic, and electromechanical (EEE) components, with attention to total ionizing dose (TID), single-event effects (SEE), and thermal cycling. Software fault tolerance, redundancy mechanisms, and real-time monitoring are also evaluated through in-situ telemetry during the mission.

Together, these two missions provide a high-fidelity, multi-environment qualification platform. The approach illustrates how scalable subsystems can be matured across diverse regimes using cost-efficient satellite and capsule-based payloads, supporting the transition from terrestrial development to spaceflight readiness.