INITIAL ACOUSTIC RESULTS FROM MARS 2020 PERSEVERANCE ENTRY, DESCENT AND LANDING CAMERA [EDLCAM] MICROPHONE SYSTEM. Jason A. Mezilis[1], Mike Houge[1]; [1] Zandef Deksit Inc., Los Angeles CA

Introduction: NASA's Mars 2020 Perseverance rover is carrying two separate microphone payloads to the surface, the first of which will activate during final descent on Feb. 18th 2021. These systems will utilize technologically varied components to attempt to capture proper acoustic measurements as never before realized in the Martian atmosphere. This presentation will highlight initial results returned from operations of the microphone associated with the Entry, Descent and Landing Camera [EDLCAM] system, including a detailed explanation of the overall mission parameters and a thorough analysis of expected versus returned results. Future scientific gains and public outreach benefits associated with this groundbreaking instrumentation will also be discussed.

Design: The EDLCAM microphone system is classified as a technology demonstration, limiting component selection to off-the-shelf readily available audio capture technology. The DPA 4006 studio instrumentation style capsule [paired with associated DPA MMA-A digital audio interface] has been chosen for its modular component structure and rugged design characteristics. The 4006 capsule's high dynamic range and balanced response curve are projected to enable distortion-free capture of the landing rockets, as well as subtle sounds of the Martian wind and all manner of audible rover operations in between.

EXTERNAL MOUNT 1/2" DIAPHRAGM DPA 4006 OMNIDIRECTIONAL CAPSULE

Primary Function: The EDLCAM microphone is primarily designed to operate during the *"seven minutes of terror"* associated with descent of the lander through the Martian atmosphere and final touchdown on the surface. The microphone will record sounds of parachute deployment, heat shield release, the rocket firing of the sky crane, and initial impact of the wheels on the surface. This audio will later be paired and synchronized with onboard multi-camera video capture of the EDL sequence for a compelling and scientifically engaging multimedia presentation. Completion of this initial acoustic recording cycle will constitute "mission success" of the EDL microphone.

Secondary Function: Following successful implementation during the EDL sequence, the EDLCAM microphone will continue to record surface audio at selected opportunities during the lifetime of the rover. At this point operations will coincide with activation of the microphone onboard the SuperCam instrument, and the possibility exists therein for overlap between these two systems for redundancy of acoustic observations, including coordination for unparalleled true stereo audio capture [1] on the Martian surface via simultaneous operations.

Discussion: Audio data returned from the EDL sequence will be shared and analyzed. While detailed theoretical studies [2] have long been conducted regarding the curious behavior of soundwaves on Mars, the fluid nature of acoustic science commonly produces complexities that are difficult to accurately model in a real-world environment. As a result, these data may be helpfully contrasted against predictive sample audio recordings generated prior to landing, to inform future acoustic modeling studies in the Martian environment.

Following this comparative analysis, investigation of further audio capture on the Martian surface for current application onboard Mars 2020 rover will be explored, including diagnostic implementation and varied public outreach opportunities. Future mission applications will also be investigated, including both technical and mental-health enhancement of human-led missions on the Martian surface.

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References:

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