MARS 2020 ENTRY, DESCENT, AND LANDING INSTRUMENTATION 2 (MEDLI2) SENSOR SUITE.

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Introduction: The Mars 2020 Entry, Descent, and Landing Instrumentation 2 (MEDLI2) sensor suite seeks to address the aerodynamic, aerothermodynamic, and thermal protection system (TPS) performance issues during atmospheric entry, descent, and landing of the Mars 2020 mission. [1] Based on the highly successful instrumentation suite that flew on Mars Science Laboratory (MEDLI)[2], the new sensor suite expands on the types of measurements and also seeks to answer questions not fully addressed by the previous mission.

Sensor Package: MEDLI2 consists of 7 pressure transducers, 17 thermal plugs, 2 heat flux sensors, and one radiometer. The sensors are distributed across both the heatshield and backshell, unlike MEDLI (the first sensor suite), which was located solely on the heatshield. The sensors will measure supersonic pressure on the forebody, a pressure measurement on the aftbody, near-surface and in-depth temperatures in the heatshield and backshell TPS materials, direct total heat flux on the aftgbody, and direct radiative heating on the aftbody.

Instrument Development: The supersonic pressure transducers, the direct heat flux sensors, and the radiometer all were tested during the development phase. The status of these sensors, including the piezoresistive pressure sensors, will be presented. The current plans for qualification and calibration for all of the sensors will also be discussed.

Post-Flight Data Analysis: Similar to MEDLI, the estimated flight trajectory will be reconstructed from the data. The aerodynamic parameters that will be reconstructed will be the axial force coefficient, freestream Mach number, base pressure, atmospheric density, and winds. The aerothermal quantities that will be determined are the heatshield and backshell aeroheating, turbulence transition across the heatshield, and TPS in-depth performance of PICA. By directly measuring the radiative and total heat fluxes on the backshell, the convective portion of the heat flux will be estimated.

The status of the current tools to perform the post-flight data analysis will be presented, along with plans for model improvements.

References:

[1] H. Hwang et al. (2016), *46th Thermophysics AIAA Conference*, AIAA 2016-3536.

[2] F. Cheatwood et al. (2014), NASA/TM 2014-218533

Figure 1. Supersonic pressure transducer developed for MEDLI2.

Figure 2. Medtherm radiometer selected for MEDLI2.