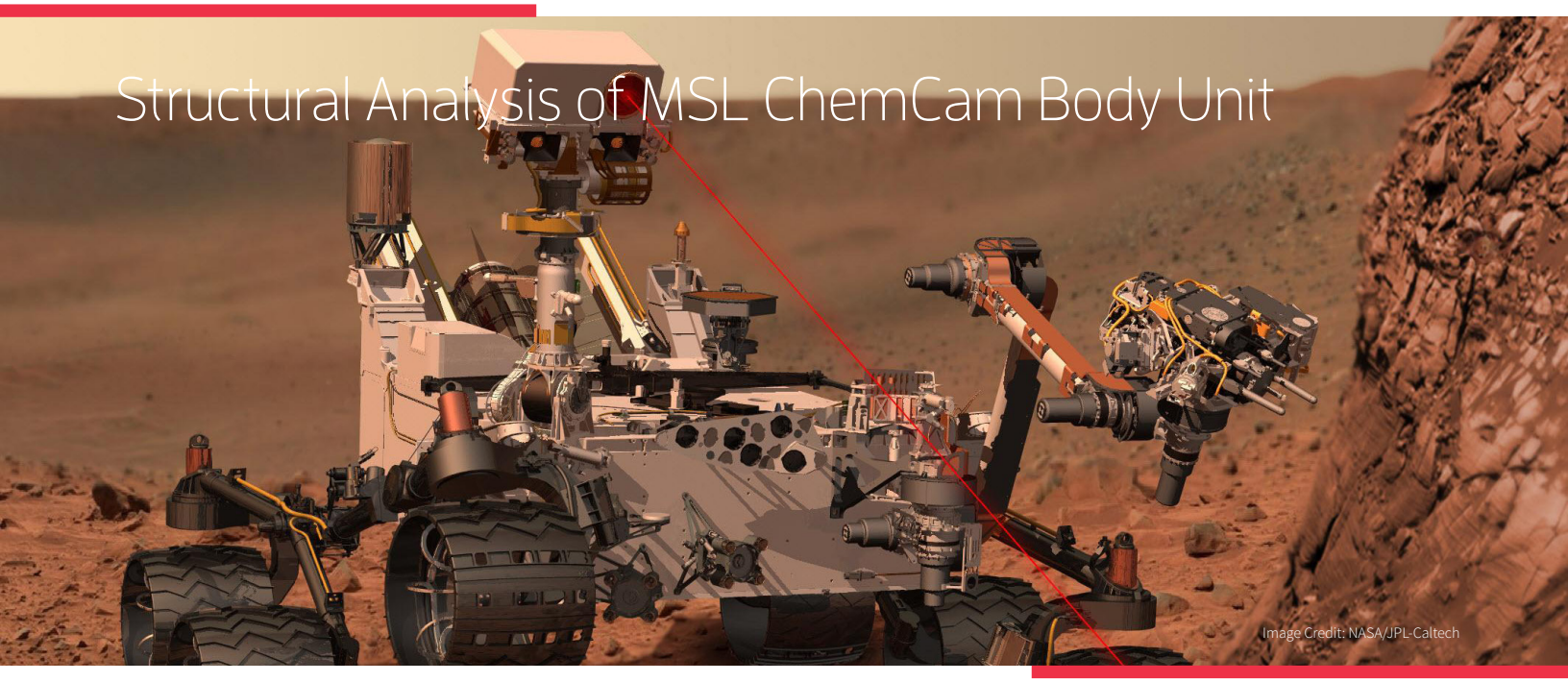
ATA ENGINEERING, INC.

www.ata-e.com
ata-engineering
@ataengineering
sales@ata-e.com
858.480.2000

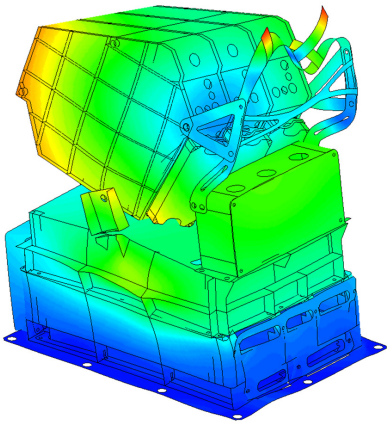


Case Study

OVERVIEW

As part of NASA's unmanned planetary exploration program, the Jet Propulsion Laboratory built a next-generation rover, called the Mars Science Laboratory (MSL). The largest Mars rover yet, MSL was sent to one of the most intriguing sites there to investigate whether ancient conditions would have favored the existence of microbial life.

The ChemCam instrument uses a laser to vaporize small amounts of material up to 7 meters away and determine their composition with an on-board spectrometer in the ChemCam Body Unit (CCBU), which must remain within a specific temperature range. ATA Engineering supported modifications to the CCBU to add an active thermoelectric cooling (TEC) system to ensure that the spectrometers operate as planned throughout the Martian day.



ChemCam mode shape

TASKS PERFORMED & KEY OUTCOMES

- Provided design guidance through the use of static, dynamic, and thermal analysis.
- Generated a detailed finite element model of the CCBU from CAD geometry.
- Calculated CCBU modes of vibration and correlated with test data.
- Performed random vibration analysis on CCBU with the TEC addition to verify that the new structure would survive the high loads seen during launch.
- Verified that the structure would survive both the cyclic thermal loading as the TEC is turned on and off and the temperature extremes seen during non-operation.
- Ensured that the new hardware maintained dynamic clearance to other MSL hardware.
- Optimized the optical-mechanical design of internal lenses to prevent loss in performance due to thermal distortion.