



Images courtesy of NASA JPL

CUSTOMER:

**NASA Jet Propulsion
Laboratory (JPL)**

INDUSTRY:

Aerospace

PROJECT NAME:

**Analysis of Mars Science
Laboratory ChemCam Body
Unit Structure**

CUSTOMER LOCATION:

Pasadena, California

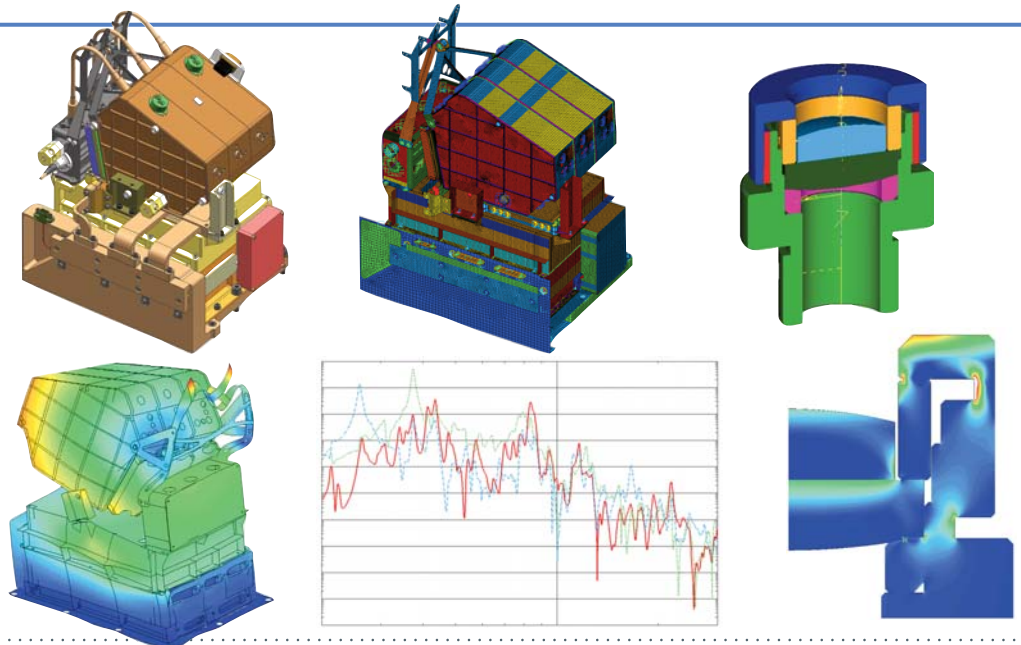
OVERVIEW

As part of NASA's unmanned planetary exploration program, the Jet Propulsion Laboratory (JPL) is building and sending a next-generation rover, called the Mars Science Laboratory (MSL), to the surface of Mars. This is the largest rover yet to be sent to Mars, and will go to one of the most intriguing sites on Mars to investigate whether ancient conditions there 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, or "CCBU". In order to operate properly the spectrometer must remain within a specific temperature range. ATA Engineering, Inc. (ATA) supported modifications to the CCBU to add an active thermoelectric cooling (TEC) system to ensure that the spectrometers are at the right temperature to operate as planned throughout the Martian day.

ATA SUPPORT INCLUDED:

- ▷ Provided design guidance to the project team through the use of static, dynamic and thermal analysis.
- ▷ Generated a detailed finite element model of the ChemCam Body Unit (CCBU) from CAD geometry.
- ▷ Calculated modes of vibration of the CCBU in its original configuration and correlated with test data.
- ▷ Performed random vibration analysis on CCBU with the thermoelectric cooling (TEC) addition to verify the new structure would survive the high loads seen during launch.
- ▷ Verified 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 a proper dynamic clearance to other MSL hardware.
- ▷ Optimized the optical-mechanical design of internal lenses to prevent loss in performance due to thermal distortion.



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