

Aeroshell

Protecting Mars 2020



Aeroshell

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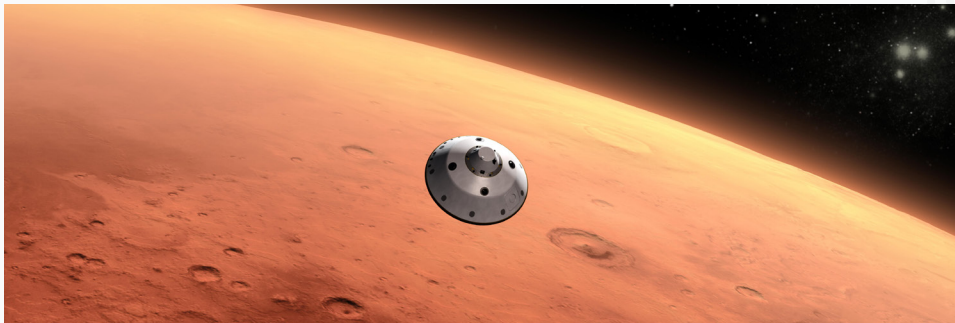
Protecting Mars 2020

NASA's Mars 2020 is the most challenging mission to the Red Planet yet. The Mars 2020 rover--built by NASA Jet Propulsion Laboratory (JPL)—will explore the Jezero Crater, an area that may have once been a river delta but is now filled with potentially treacherous boulders and sand dunes.

An aeroshell designed and built by Lockheed Martin Space will protect the Mars 2020 spacecraft and rover during their deep space cruise to Mars and final descent through the planet's atmosphere.

Lockheed Martin has designed and built every aeroshell flown by NASA to Mars, but none as large as the Mars 2020 aeroshell. It measures about 15 feet (4.5 meters) in diameter, compared to just less than 13 feet (4 meters) for the Apollo capsules.

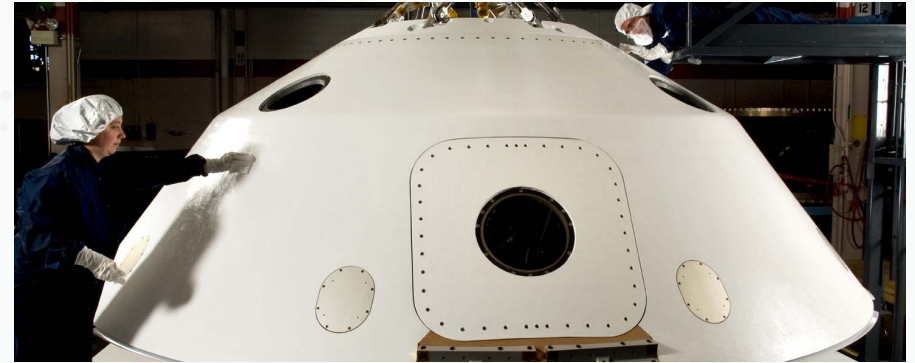
The blunt-nosed aeroshell's design provides a precise landing, as did the Mars Science Laboratory (MSL) aeroshell. Ejection of ballast before entry into Mars' atmosphere offsets the aeroshell's center of gravity and creates lift that is used to guide the aeroshell through roll control and autonomous steering. This precision guidance will improve the accuracy of the landing ellipse from hundreds of kilometers to within 20 kilometers (12 miles).



EXPLORING THE PAST AND FUTURE

Mars 2020 is scheduled to launch in July/August 2020. As part of NASA's Mars Exploration Program, the Mars 2020 rover mission's science tasks include:

- Seek evidence of past microbial life
- Look for signs of habitable conditions in ancient past
- Collect and cache soil and rock core samples for future study
- Gather knowledge and demonstrate technologies needed for human exploration



BACKSHELL

The backshell is half of the large and sophisticated two-part aeroshell capsule. In addition to protecting the rover during cruise and descent, the backshell provides structural support for the parachute and unique sky crane, a system that will lower the rover to a soft landing on the Martian surface. The biconic-shaped backshell is covered with super light ablator (SLA) 561V, a cork/silicone thermal protection system that was created by Lockheed Martin and originated with the Viking landers in the 1970s.

HEAT SHIELD

Because the unique entry trajectory will create external temperatures up to 3,500 degrees Fahrenheit, the heat shield—the rounded, bottom portion of the aeroshell—uses the tiled phenolic impregnated carbon ablator (PICA) thermal protection system. This will be the second time PICA will fly on a Mars mission. The Mars Science Laboratory (MSL) rover mission in 2011 was the first to use PICA.

Lockheed Martin and JPL will integrate the Mars Entry Descent and Landing Instrumentation 2 (MEDLI2) into the heat shield and backshell. The instrument suite will assess the spacecraft's aerothermal, thermal protection system and aerodynamic performance during entry, descent and landing (EDL). The data will help improve future Mars missions.

