Lockheed Martin Delivers Mars Science Laboratory Backshell To NASA's Jet Propulsion Laboratory

Lockheed Martin recently delivered the backshell for the Mars Science Laboratory (MSL) to NASA's Jet Propulsion Laboratory in Pasadena, Calif. The backshell is half of the large and sophisticated two-part aeroshell that will encapsulate and protect the MSL rover during its deep space cruise to Mars, and from the intense heat and friction that will be generated as the system descends through the Martian atmosphere.

Lockheed Martin has designed and built nearly every capsule flown by NASA for space exploration since Apollo, but none as large as the MSL aeroshell at about 15 feet in diameter. For comparison, the heatshields of the Spirit and Opportunity Mars Exploration Rovers measured 8.5 feet and Apollo capsule heatshields measured just under 13 feet.

In addition to protecting the rover, the backshell provides the structural support for the parachute and unique sky crane, a system that will lower the rover to a soft landing on the surface of Mars. The MSL biconic-shaped backshell is made of an aluminum honeycomb structure sandwiched between graphite-epoxy face sheets. It is covered with a thermal protection system composed of the cork/silicone super light ablator (SLA) 561v that originated with the Viking landers.

SLA 561v has been used on the heatshields of all Mars landers mission of past, but this is the first time it will be used on the backshell of a Mars mission. Lockheed Martin used the proprietary ablator on the backshell of the successful Genesis mission.

"The biggest challenge for the MSL aeroshell is its gigantic size," said Steve Jolly, Lockheed Martin Space Systems Company program manager for the MSL aeroshell. "It's almost double the size of our Mars Exploration Rovers' [Spirit and Opportunity] aeroshells. When you are building a structure that big, there are many considerations we had to take into account, including the fact that this is a lifting capsule that is steerable."

Designed to provide a more-precise landing than previous missions, the steering capability is produced by ejecting ballast that off-sets the center- of-mass prior to entry into the atmosphere. This off-set creates lift as it interacts with the thin Martian atmosphere and allows roll control and autonomous steering through the use of thrusters.

Scheduled for launch in the fall of 2009, the Mars Science Laboratory -- built by the Jet Propulsion Laboratory -- will support the Mars Exploration Program's strategy of "follow the water" and will have the science goals of determining whether the planet was ever habitable, characterizing the climate and geology of Mars, and preparing for human exploration.

The second half of the MSL aeroshell, the heatshield, is still in production at Lockheed Martin's Denver, Colo., facilities and is currently undergoing installation of the Phenolic Impregnated Carbon Ablator (PICA) tiles. It is scheduled to ship to Kennedy Space Center in April 2009.

The shipping of the MSL backshell comes just four months after the spectacular entry, descent, and landing of the Phoenix Mars Lander which also used an aeroshell system. Both the aeroshell and lander were designed and built by Lockheed Martin.

Lockheed Martin Space Systems Company, a major operating unit of Lockheed Martin Corporation, designs, develops, tests, manufactures and operates a full spectrum of advanced-technology systems for national security, civil and commercial customers. Chief products include human space flight systems; a full range of remote sensing, navigation, meteorological and communications satellites and instruments; space observatories and interplanetary spacecraft; laser radar; fleet ballistic missiles; and missile defense systems.

Headquartered in Bethesda, Md., Lockheed Martin is a global security company that employs about 140,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services. The corporation reported 2007 sales of $41.9 billion.

NOTE: A photograph of the MSL aeroshell being built at Lockheed Martin is available at: http://www.lockheedmartin.com/news/press_releases/2008/1016mslbackshell.html

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