Lockheed Martin Orion Team Fabricates World's Largest Heat Shield Structure

Innovative high-temperature material system to provide better crew protection

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The Lockheed Martin -led team developing the Orion crew exploration vehicle achieved a major technology milestone by completing fabrication of the world's largest heat shield structure. The shield is five meters (16.4 feet) in diameter and is critical to the protection of the spacecraft and its crew from the extreme temperatures experienced during re-entry. The work was completed at Lockheed Martin's composite development facility in Denver, Colo.

The crew exploration vehicle is at the height of its development phase, which has spurred several new technologies and innovations such as a cutting edge high-temperature composite material system. The new system was developed by the Lockheed Martin Orion thermal protection system team in partnership with TenCate Advanced Composites, a leading supplier of aerospace thermoset and thermoplastic prepregs. TenCate's composite materials are used in commercial aircraft, radomes, satellites, general aviation, oil and gas, medical and high-end industrial applications.

"In addition to the technology advancement, we achieved a $10 million cost savings and improved the project schedule by 12 months through the innovative tooling, materials and fabrication processes the team put into action," explained Cleon Lacefield, Lockheed Martin vice president and Orion program manager.

The new resin system was developed over an 18-month period during which thousands of coupons were tested in extreme environments that simulated a ballistic re-entry from a lunar mission. The team verified that the thermal insulator on the outside of the composite material can be thinner due to the higher temperature capability, resulting in improved mass optimization of the Orion spacecraft.

The new resin system enables much simpler and more efficient manufacturing techniques compared to other high temperature resin systems. This resin system has the potential to be used in a wide range of commercial applications including aircraft, automobiles, launch vehicles, payload fairings, and re-entry vehicles.

The expansive heat shield will be applied to the Orion ground test article, which is the first full-sized, flight-like test article for Orion being built at the Michoud Assembly Facility in New Orleans, La. The ground test article is designed to serve as a production pathfinder to validate the flight vehicle production processes and tools. When completed, the crew module will be tested on the ground in equivalent flight-like environments, including static vibration, acoustics and water landing loads. This early high fidelity testing is necessary to correlate sizing models for all subsystems on the vehicle.

Lockheed Martin is the prime contractor to NASA for the Orion crew exploration vehicle. The Lockheed Martin Orion Project office is based in Houston, Texas, near NASA's Johnson Space Center. The team includes major subcontractors Aerojet, Alliant Techsystems (ATK), Hamilton Sundstrand, Honeywell, Orbital Sciences Corporation and United Space Alliance; and an expansive network of minor subcontractors and small businesses working at 88 facilities in 28 states across the country.

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 2009 sales of $45.2 billion.

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