



Information

Orion to Be One Lean, Mean Space Faring Machine *Lean manufacturing processes to keep recurring costs down*

PASADENA, CA – Sept. 15, 2009 – Discrete Event Simulations (DES), Lean manufacturing and risk mitigation trade studies are just a few of the processes Lockheed Martin and United Space Alliance are integrating into the Orion Assembly, Integration and Production (AI&P) operational analysis to control the life cycle costs of the spacecraft.

Targeted to launch its initial mission to carry astronauts to the International Space Station in 2015, the Orion crew exploration vehicle is NASA's flagship of the Constellation Program's plan to return humans to the moon and prepare for future voyages to other destinations in our solar system.

"DES is a critical manufacturing Concept of Operations (CONOPS) validation tool we are using to size the factory operations and provide opportunities for improvement early in Orion's development phase," stated Lloyd Gregg, United Space Alliance Orion program manager, who presented this concept today at the AIAA Space 2009 Conference.

Gregg further explained that Lockheed Martin began this process two years before the first hardware is scheduled to arrive at Kennedy Space Center so insight of the critical features and requirements can be understood to discover potential operability issues that can be mitigated in the design process. "By leveraging USA's human space flight expertise and utilizing lessons learned from decades of shuttle processing, Lockheed Martin has developed a tool that can adjust factory CONOPS to reduce vehicle cycle time and processing costs," said Gregg. "Essentially we will have virtually manufactured the first Orion Flight Test Article for Ascent Abort 2 multiple times before the parts actually arrive in Florida."

Orion will ultimately be assembled in the historic Operations & Checkout Building at NASA's Kennedy Space Center in Florida. The facility was certified earlier this year following the completion of a \$55 million renovation funded by the State of Florida, Lockheed Martin and NASA to create a state-of-the-art facility to support NASA's future human space flight endeavors.

The O&C facility upgrades will enable on-site manufacturing and assembly of the spacecraft at KSC just before it is put onto the launch stack, which is a first for NASA's human space flight programs. "This capability will save a tremendous amount of time and cost in preparing for a launch since there is no cross-country shipment of the vehicle requiring additional test and checkout upon arrival at KSC," said Gregg.

USA has also been tasked by Lockheed Martin to provide the design and fabrication of the tooling structures for manufacturing in the O&C. Significant time and cost savings have already been realized on Orion hardware now being fabricated for the O&C facility. "By implementing Lean manufacturing* processes at our facility, we reduced the timeline for this project by nearly 30 percent," said Jeff Flick of EMF, Inc., an Orion USA

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subcontractor located in Merritt Island, Florida. “By involving our quality assurance staff in the procurement process, our purchasing agents were able to make more informed decisions which resulted in improved receiving, work flow and fabrication operations. However, the most surprising outcome was the positive effect on our workforce morale due to better teamwork.”

As the prime contractor to NASA for the Orion Project, Lockheed Martin [NYSE: LMT] is responsible for designing and building the Orion crew exploration vehicle, a state-of-the-art spacecraft that will have more flexible space exploration capability than any previous human space flight vehicle.

United Space Alliance (USA) is supporting Lockheed Martin’s Orion project in design and development of hardware and software for both flight and ground. USA’s primary roles include: performing the assembly, integration, and processing of the Orion capsule at the Kennedy Space Center; providing operations expertise to the Lockheed Martin design and engineering team to ensure optimum operability and producibility; developing the initial Orion avionics integration test facility at the Johnson Space Center; and providing portions of the onboard flight software.

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 a network of 60 minor subcontractors and small businesses in 22 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 2008 sales of \$42.7 billion.

**Lean manufacturing is an industry production practice implemented to create more value with less work. Any expenditure of resources for any goal other than the creation of value for the end customer is considered to be wasteful, and thus a target for elimination.*

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A video animation of the Operations & Checkout Facility Orion Assembly can be viewed at:
<http://www.lockheedmartin.com/data/assets/ssc/Orion/animation/OandCvideo-animation.mpg>

Low- and high-resolution JPEG image files of Orion are available at:
<http://www.lockheedmartin.com/products/Orion/OrionToolkit/orionimages.html>

More information about USA can be found at www.unitedspacealliance.com
View Orion Progress: http://www.nasa.gov/pdf/382800main_Orion_Progress_at_PDR-August_2009.pdf

Media Contacts:

Jessica Pieczonka, United Space Alliance, 832-205-0480 / 281-282-6252, jessica.b.pieczonka@usa-spaceops.com

Linda Singleton, Lockheed Martin: 832-526-8089 / 281-283-4219, linda.singleton@lmco.com