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HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Governmental Human Spaceflight Programs (Overview) (1)

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DEVELOPMENT STATUS OF THE “EUROPEAN BUILT” ORION SERVICE MODULE

Abstract

In December 2012, NASA and the European Space Agency (ESA) signed an implementing arrangement whereby ESA develops the Service Module of the Orion vehicle. ESA develops the vehicle and delivers the first flight unit to NASA in exchange for services in the frame of the International Space Station operations and exploitation. The Orion vehicle is developed by Lockheed-Martin under NASA contract. The Service Module is an essential element providing four main critical functions: propulsion, power generation, heat rejection and provision of consumable resources. The first mission of Orion, named Exploration Mission 1, will be an un-crewed mission to the Moon using a distant retrograde orbit (DRO). ESA entrusted the development of the European Service Module (ESM) to a consortium of European industries lead by Airbus Defence and Space GmbH. The consortium of companies was selected to re-use the experience and industrial heritage of the very successful Automated Transfer Vehicle (ATV). Following a brief description of the vehicle architecture and the main stake holders of the project, this paper will describe the challenges of the ESM development such as the stringent schedule requirement and its consequences on the development approach, the implementation of the Space Shuttle Orbital Manoeuvring System Engine (OMS-E) as ESM main engine and the concurrent development of systems across the Atlantic. In addition to the existing OMS-E, NASA and Lockheed Martin are providing solar cells, auxiliary propulsion engines and network interface cards to Airbus Defence and Space GmbH for integration into the ESM. The paper will then present the ESM development progress. The ESM system Preliminary Design Review (PDR) was held successfully in summer 2014 and the sub-system PDRs in the second half of 2014. A number of bread-boarding tests were successfully performed to mitigate the risk from new technologies or new requirements such as the electrical pressure regulation for the propulsion pressurisation system, the high commanding frequency of the attitude control thrusters, the Time Triggered internet communication protocol, the solar array drive brake and the manufacturing of the advanced radiators. The manufacturing of the Structural Test Article is well on its way for a delivery to the NASA Plum Brook test facility in the United State in October 2015, and the manufacturing of the first components of the flight structures was kicked-off in January 2015. The long lead items for the propulsion and avionics sub-system will be procured in the beginning of 2015 allowing early manufacturing of engineering/test models. The system CDR is planned for the end of 2015, and the delivery of the ESM flight model to NASA Kennedy Space Centre for Orion vehicle integration and final verification of the integrated vehicle in early 2016.