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THE ORION-EUROPEAN SERVICE MODULE: ONE LAST SMALL STEP UP TO QUALIFICATION

Abstract

The Orion Multi-Purpose Crew Vehicle (MPCV) is the next generation spacecraft that NASA currently develops to send humans and cargo to the moon and beyond and return them back to earth safely. The vehicle, which will be launched by the new Space Launch System (SLS), is designed to support long-duration deep space missions. The first exploration mission is planned to take place beginning of 2020 as an un-crewed lunar fly-by mission followed by a second exploration mission late 2021 taking astronauts to the moon. The MPCV resembles its Apollo predecessors and will consist of a habitable Crew Module (CM) and a disposable European Service Module (ESM) that provides power, life support, and in-space propulsion.

NASA, ESA, European and US Industry are working together to develop the Orion spacecraft. ESA is responsible for the ESM and awarded a contract to Airbus DS GmbH for its development and production of the first flight unit. The ESM provides translational thrust and 3 axis attitude control for the spacecraft, stores life support consumables for the crew module (oxygen, nitrogen and water), and provides thermal control and power.

In November 2018 the first flight model (ESM-1) of the Orion-ESM was shipped to Kennedy Space Center (KSC) in Florida closing out the integration and acceptance testing of the flight unit. Since then the ESM was connected to the CM and the subsequent acceptance tests were started in the so-called ATLO phase connecting for the first time the on-board computer and the flight software located in the CM with the support subsystems located in the ESM like the propulsion subsystem (PSS), the thermal control subsystem (TCS), the consumables subsystem (CSS) and the power avionics subsystem.

In parallel the qualification activities for the ESM Equipment, Subassemblies and Subsystems were continued by Airbus DS in order to arrive to an ESM Qualification Review late 2019.

This paper presents the actual status of the Orion ESM program close to the Qualification Review (QR) by end of 2019 including the verification activities on the PSS Propulsion Qualification Model (PQM) and ESM electrical and functional qualification model (ESM-QF) as well as the verification results coming out of the ATLO phase testing. At the end the actual status of ESM-2 and ESM-3 activities are presented.