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DEVELOPMENT OF VALVES FOR THE ORION ESM PROPULSION SUBSYSTEM MARK II

Abstract

Airbus Defence and Space has been selected by ESA to develop the European Service Module (ESM) for NASA's next human rated spacecraft Orion that will bring humans around the moon and possibly to Mars. The ESM consists of multiple subsystems such as the Consumables Subsystem (CSS) or the Propulsion Subsystem (PSS).

Three types of engines can be found in the PSS: the Main Engine (Orbital Maneuvering System – Engine, OMS-E, the Auxiliary Engine (AUX), and the Reaction Control System (RCS). Each of the engines has their own isolation valves in order to isolate the engine from the propellant tanks: the main line isolation valve (MLIV), the AUX branch isolation valve (ABIV), and finally the RCS branch isolation valve (RBIV).

For the first two flights a serial tank configuration has been chosen. In the PSS upgrade, the so called Mark II, a parallel propellant tank configuration has been chosen and it is intended to utilize this configuration for the third flight onwards. Since the redesign of the PSS is so significant, certain trade offs had to be made for the isolation valves.

This paper focuses on the system level impacts of the PSS redesign on the Mark II valves. Furthermore, due to ambitious schedule and parallel execution of the first, second, and third flight model a special Systems Engineering approach has been applied and this approach will be presented here.