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Quality and safety, a challenge for traditional and new space (1)

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CHALLENGES AND OPPORTUNITIES OF INTERNATIONAL COOPERATION IN THE DISCIPLINE OF SAFETY & MISSION ASSURANCE (SMA) ON THE EUROPEAN SERVICE MODULE (ESM) OF THE ORION PROGRAM

Abstract

ESA is providing the ESM for the Orion Program in accordance with the Implementing Arrangement established between the two Agencies in 2012. This arrangement was established in a barter arrangement in which ESA provided SMs for the first two flights of Orion in place of two servicing missions to the ISS. This arrangement represents an important opportunity for ESA to build on its experience in the development and operations of ATV and play a role in the development and flight of a manned space vehicle. This paper will explore some of the unique aspects of this arrangement as it affects SMA.

The assessment of compliance of the ESM to the applicable safety requirements is the responsibility of the Joint Safety and Engineering Review Panel (JSERP). The JSERP has two features that are relatively unique amongst NASA safety panels. First, this Panel is co-chaired by both NASA Engineering and SMA organizations. Inclusion of Engineering as a co-Chair has allowed for greater leverage within the technical community. Second, the JSERP has a second set of co-chairs from ESA Engineering and Product Assurance and Safety (PA/S) organizations. This recognizes the international arrangement as one of partnership.

Another source of both opportunity and challenge is the differing heritage of experience brought to the arrangement by ESA and NASA. NASA has decades of experience in manned spaceflight, dating back to the Mercury program and following through Gemini, Apollo, ASTP, Skylab, Shuttle and ISS. The risk posture for manned missions is much more rigorous than for unmanned missions. ESA brings a wealth of knowledge as well, with their flights of Ariane and ATV, development and operation of the Columbus ISS module, and satellite programs. The result is that both parties have developed paradigms related to risk and failure that contribute to ESM discussions.

Aside from the NASA experience with Apollo, Orion represents mankind's first venture beyond LEO in over fifty years. Much of that experience is documented, but first-hand knowledge is limited to a few spaceflight veterans. Missions to LEO have offered the opportunity of direct, near-instantaneous communications and assistance, and the ability to return to Earth within a matter of hours in case of emergency. Outward-bound missions do not have these features and will require a more autonomous vehicle. This paper will explore these challenges as we approach the flight of the first Orion vehicle.