

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

Author: Mr. Anthony Thirkettle
European Space Agency (ESA), The Netherlands, anthony.charles.thirkettle@esa.int

Mr. William Hartwell
National Aeronautics and Space Administration (NASA), Johnson Space Center, United States,
william.l.hartwell@nasa.gov
Mr. Dirk Schulze-Varnholt
Airbus Defence and Space, Germany, dirk.schulze-varnholt@airbus.com
Mr. Georg Monien
Airbus Defence and Space, Germany, georg.monien@airbus.com
Mr. Brian Huermann
Airbus Defence and Space, Germany, brian.huermann@airbus.com
Mr. Siddharth Poornachandran
Germany, siddharth.poornachandran@scalian.com
Mrs. Lori Rauen
Lockheed Martin Space Systems, United States, lori.a.rauen@lmco.com

THE SECOND EUROPEAN SERVICE MODULE (ESM-2) EVOLUTIONS, PRODUCTION AND
CHALLENGES

Abstract

This paper presents an overview of the Second European Service Module (ESM-2), which is the second in the series of European Service Modules produced as part of the Barter agreement between NASA and ESA for the Orion Programme. The European Industrial consortium is lead by the Prime Contractor Airbus Defence and Space in Bremen. The ESM-2 contract between ESA and Airbus was signed on the 16 February 2017.

The ESM-2 is a key element of the Orion Exploration Mission 2 (EM-2), which will be a historic mission for Europe, as ESM-2 will be the first European spacecraft to be part of a human transportation system carrying humans beyond low Earth orbit.

ESM-2 is mainly a recurring production following ESM-1. Nevertheless, there are a number of important changes that are being implemented, for example to incorporate loads for the new Exploration Upper Stage (EUS) of the Space Launch System (SLS) and upgrades to further enhance safety and reliability. The challenging delivery schedule for ESM-2 has driven the need to commence manufacturing prior to completion of the qualification on ESM-1. In addition, some deviations and non-compliances which were accepted for ESM-1 have resulted in modifications for ESM-2.

In order to manage the competing constraints effectively the ESM-2 Team has put in place a number of novel approaches, including schedule robustness measures, risk sharing and the technical baseline matrix.

Airbus has set up multi-functional teams according to an approach known as “Major Spacecraft Deliveries” consisting of quality assurance, engineering and procurement. The risk of starting manufacturing prior to qualification is managed through a special risk share agreement. This agreement necessitates rigorous risk reviews across the board for all manufacturing, assembly, integration and test milestones. The ESM-2 changes are managed by Configuration Management, but Airbus has also introduced the Technical Baseline Matrix to provide a transparent top level overview of the changes from ESM-1 to ESM-2. The

tool provides the basis for ESM-2 design and development needs, decisions, as well as the input for the Orion EM-2 Critical Design Review (CDR).

The main technical evolutions, status of the production and the novel management approaches for ESM-2 are presented and discussed in the paper.