

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

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THE EUROPEAN SERVICE MODULE FOR ARTEMIS MISSION: THALES ALENIA SPACE  
CHALLENGES AND LESSONS LEARNED FROM THE FIRST THREE UNITS EXPERIENCE

**Abstract**

The European Service Module (ESM) is an ESA program part of a major new exploration path bringing back the man to the Moon in areas never reached up to now and it is paving the path for a Deep Space Gateway as well as Mars Exploration. Thales Alenia Space, as Airbus subcontractor, plays a primary role in the ESM developing the Structure, Thermal and Consumable Storage systems. The International Space Station experience was the basis to be so deeply involved in this program, but since the beginning we faced several challenges associated to very different needs and requirements with respect to the other manned elements, mainly in terms of required performances, radiation environment, of reliability and safety. In addition to that we had to develop new products like the Water Tanks, the radiators and to procure very specific components in terms of Gas Tanks, Valves and Pressure Regulators and Fluid Control Assembly. The mission has been facing very demanding challenges in terms of mass and schedule since the beginning, leading to a continuous evolution of the design, testing and integration solutions to meet such stringent requirements. We are now in charge of developing 3 units, the first unmanned already fully integrated and delivered to Kennedy Space Center, the second for a manned mission under final integration in Bremen and the third under manufacturing in Turin. We are also getting prepared for additional 3 to 6 units to sustain the overall NASA scenario in the frame of the Artemis program. The aim of this paper is to outline the main technical challenges encountered in the development, integration and test of the 3 systems and of the internal products. It is also addressing how to manage the difference between the 3 units and the program evolution. Focus will be provided on the complexity of the integration scenarios as well of the program environment often requiring decisions involving different interfaces up to 6 main parties. Special attention is given to lessons learned both at high level (like for initial requirement assessment) and at low level (for example derived from very specific technical issue or non conformances) developed based on experience of the first unit and how to address it for the future. Finally the paper will address how the ESM experience will be of benefit for future element part of the International Exploration Program.