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Human Exploration of the Moon and Cislunar Space (1)

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GATEWAY, PAVING THE WAY TO DEEP SPACE HUMAN EXPLORATION AND INNOVATIVE
TECHNOLOGIES

Abstract

Since 2016, Thales Alenia Space is contracted by the European Space Agency (ESA) to support the definition of the European contribution to the Lunar Orbital Platform and Gateway and is now in charge of one of the two Phase A/B1 studies of these elements. The Gateway will be a major element to support human exploration beyond LEO: toward Moon Surface and Mars. The Gateway will also enable a more sustainable operation, by supporting long-term stay on the Moon and re-use of spacecrafts. On a NRHO orbit with an aphelium above the South Pole, the Gateway will provide communication coverage to the South Polar Region and the far side of the Moon and in particular Schrodinger basin, lands of high interest for worldwide scientists. The paper will focus on the description of the 2 modules of the Gateway under European responsibility:

- ESPRIT, which Thales Alenia Space in France is currently designing with a major contribution of OHB. ESPRIT is the first European module to be launched in 2023-2024 timeframe, to bring new and enhanced functionalities to Gateway: Lunar Communication Relay, Xenon and Hydrazine refueling, science airlock to deploy external payloads supporting scientific use of the Gateway. These innovative functions will prepare new in-orbit services and be enabler for further exploration: refueling of spacecraft will be a key to enable re-use of vehicle. Results of the related technology demonstration will be reported in the paper.

- The International Habitat (IHAB), led by the European Space Agency with contribution of the NASA and JAXA and which Thales Alenia Space in Italy is currently designing, is a pressurized module providing habitability and life support functions. It will support the utilization of the cislunar infrastructure accommodating scientific payloads and technological demonstrations, operated both in crewed and in uncrewed mode. An important function of the IHAB will be to act as connecting node for other infrastructure elements, as visiting logistic vehicles and Lunar ascender vehicles. Planned to be launched in 2025 timeframe on the Space Launch System (SLS), the IHAB will represent the evolution of the ISS elements to a new generation of modules for deep space exploration.

Finally, the paper will conclude on the mid-term perspectives of the Gateway and the benefit of European contribution to prepare ESA Moon Village vision and Martian exploration.