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FROM ISS TO THE DEEP SPACE GATEWAY AND BEYOND: KEY TRENDS IN HUMAN SPACEFLIGHT SOLUTIONS

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The January 2018 GER (Global Exploration Roadmap) introduces the concept of the Deep Space Gateway (DSG) as the next step beyond LEO in the Human Space Exploration. Planned for buildup in the first half of 2020s, the DSG is conceived around two key elements, a Power Propulsion Element and a Habitat Module, complemented by an Airlock, a Robotic Arm, possible Refueling Element and logistic carriers. It will be used as a platform in cislunar environment to host the crew of Orion during its regular visits of about one month once per year, and as an outpost for missions to/from Moon. Starting in the second half of the next decade, it might act as well as an orbital base for final outfitting of the next generation Habitats (Deep Space Transport, DST) which will support longer human journeys into deep space and towards Mars. Leveraging on the large know-how acquired in the development of the several pressurized modules built for the ISS, Thales Alenia Space is actively working in designing the new generation of deep space Habitats, accounting for a proper balance between heritage and innovation, to ensure fulfilment of relevant technical and programmatic, e.g. schedule, requirements. This paper will analyze which key differences in objectives and scenario of the cislunar DSG Habitat impact its design with respect to the solutions adopted for ISS Modules: launch and assembly approach, environment, interior design for enhanced ergonomics, software architecture. The evolution of the Habitat for the second phase of the deep space exploration (the so-called Deep Space Transport) will also be drawn, to an even more 'human-centered' design, with improved habitat autonomy, for mission sustainability and reliability. The DSG will also be the first potential 'test bench' for demonstration of key technologies for deep space exploration in a representative environment.