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DEVELOPMENT UPDATE ON MODUL INTERPLANETARY TRANSPORT SYSTEM (M-ITS) 2021 CASE STUDY OF THE LUNAR ORBITAL PLATFORM-GATEWAY (LOP-G)

Abstract

Lunar Orbital Platform-Gateway (LOP-G) is a connecting element between spacecraft arriving from Earth and spacecraft departing for the Moon and vice versa under Artemis Program. LOP-G is designed to support the Artemis missions therefore to match short term goals. Current LOP-G's design heavily depends on the other elements of the Artemis program, allows for a niche use of the station and has a tendency to become obsolete and useless. Over the last year the development of the Modul Interplanetary Transport System (M-ITS) has been focused on improving LOP-G's design by basing it on the M-ITS's platform. From the initial ideas on the M-ITS has been designed as a universal spacecraft therefore its design allows the spacecraft to be converted into a Space Station. The paper provides an overlook of the changes made to the M-ITS and Modul Spacecraft in the last year. First part of the paper analyses the current LOP-G's design and its role in near and mid-future Exploration Missions. It evaluates the station's architecture, design of the modules and assembly profile. The primary focus is given on studying options and feasibility of using the LOP-G to support the Cis-Lunar Missions beyond the Artemis Program and the Deep Space Missions. Main trends in space exploration, current and near future space infrastructure were also considered. Findings were used to design an alternative version of the LOP-G based on the M-ITS's platform. Second part of the paper provides an overview of the development process and presents a new design of the LOP-G. Development included designing overall station's design, modules and main systems. The LOP-G modules already under construction have been incorporated into new design in unchanged form. In addition the assembly architecture and mission profiles with the M-ITS's and other Cis-Lunar and Deep Space Missions were developed. New design overcomes the problems current LOP-G's design faces as a result of the short-term focused development. It improves on sustainability and justifies the costs and resources needed to establish and maintain an outpost in Cis-Lunar Space by supporting a variety of missions and permanent crew occupation. As the design is based on the M-ITS's platform it benefits from the modular, configurable and scalable architecture. In addition it allows to integrate or reuse the station into future missions without compromising the preferred mission objectives, outputs and costs while remaining compatible with the future spacecraft and space infrastructure.