IAF SPACE SYSTEMS SYMPOSIUM (D1)
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Author: Mr. Diego A. Urbina
Space Applications Services, Belgium, diego.urbina@spaceapplications.com

Mr. Thibaud Chupin
Space Applications Services, Belgium, thibaud.chupin@spaceapplications.com
Mr. Hemanth Madakashira
Space Applications Services, Belgium, hemanth.madakashira@spaceapplications.com
Mr. Mathieu Deremetz
Space Applications Services, Belgium, mathieu.deremetz@spaceapplications.com
Mr. Karsten Kullack
Space Applications Services, The Netherlands, karsten.kullack@spaceapplications.com
Dr. Jeremi Gancet
Space Applications Services, Belgium, jeremi.gancet@spaceapplications.com
Ms. Janos Biswas
Technische Universität München, Germany, j.biswas@tum.de
Mr. Christian Gscheidle
Technical University of Munich, Germany, c.gscheidle@tum.de
Mr. Martin J. Losekamm
Technical University of Munich, Germany, m.losekamm@tum.de

MODULAR ARCHITECTURE FOR THE ACCOMMODATION OF LUNAR EXPLORATION PAYLOADS ON THE LUVMI-X ROVER

Abstract

LUVMI-X is a compact and lightweight rover capable of supporting a variety of lunar-surface exploration missions. It is equipped with a set of well-defined and standardized interfaces that will allow researchers the flexibility to fly on different missions. This flexibility is increasingly important as flight opportunities become more frequent through the utilization of commercial transportation and landing systems. Due to the compactness of the rover, it is crucial to take into account the limited availability of key commodities like mass, volume, and power in the accommodation of payloads. On LUVMI-X, we intend to overcome this challenge by leveraging existing standards widely used by the community, such as the CubeSat standard, to balance the constraints of the rover with the needs and expertise of the payload developers. The 30-kg rover can carry up to 24 kg of payloads in a volume of 24 U (24,000 cm3) and is equipped with a combination of a passive and an active suspension system for enhanced mobility in rugged terrain. It can assume a compact stowage configuration (0.85 m by 0.77 m by 0.35 m stowed vs. 1.14 m by 0.77 m by 0.8 m deployed) and provides direct access to the lunar surface without the need for a robotic arm. The modular payload configuration offers unobstructed fields of view in various directions for instruments mounted on the mobile platform. The rover is also equipped with mechanisms to soft-deploy and launch payloads for remote operations on the lunar surface. In this paper, we describe the challenges of standardization and present the design of the mechanical and electrical interfaces currently being matured by Space Applications Services in collaboration with a team of experienced payload developers. We also outline the concept of operations of the initial LUVMI-X reference mission and describe use cases of payloads studied and developed within the project, exemplary payloads from external PIs, and possible

future applications.