IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Ms. Julie LESPAGNOL
International Space University, France

Mr. Patrice GODON
France
Mr. Pascal Barbier
Air Liquide, France
Mr. Yannick JUANICO
Air Liquide, France
Mr. Nisheet Singh
Spartan Space, France
Mr. Thibaud GOBERT
Spartan Space, France
Dr. Peter Weiss
Spartan Space, France

VERSATILE CREW AND CARGO MOBILITY PLATFORM FOR LUNAR SOUTH POLE LOGISTICS

Abstract

The Moon will be the first step for human expansion across the solar system with the objectives to collect new knowledge and opportunities. NASA already operated three Lunar Roving Vehicles (LRV) to support the crew on the surface by extending their radius of exploration, transporting the geology equipment and the samples. The three LRV achieved with success their mission in 1971 and 1972. But even before Apollo, two Soviet Lunokhod rovers were the first robots to be teleoperated from Earth in 1970 and 1973. They contributed to give the first precise measurements between the Earth and the Moon and various data about the lunar environment. Each of these systems were sent for a unique mission to the Moon sometimes only for three days. Since they were assigned only to one mission, it required to launch each time a new rover.

Today, the situation has changed: All major space agencies target a quite limited geographic zone on the Moon: the lunar South Pole. While the closest distance between the different landing spots of Apollo was 181km (Apollo 12 and 14), future missions will land in a perimeter that has approximately the size of Paris. This concept of operations bears a significant opportunity to build up system of *Lunar Logistics* on the surface; meaning assets and installations that are not used for a single mission but that serve over longer periods of time and several missions. Future activities include scientific exploration, extraction (ISRU), and the transport of the crew and cargo.

The target of this study is to evaluate a solution which could serve all these operations with only one base vehicle following a sustainable approach and a cost optimization. Having one versatile platform could offer multiple advantages: the time optimization of the use of the rover, the possibility to launch more equipment, the standardization of the parts. Taking into account lunar environment constraints (and advantages) new technologies could be proposed such as fuel cells to power the rover. Coupled with ISRU this system could demonstrate a lunar hydrogen logistics similar to Earth.

The methods combine the requirements from the different missions to propose a common platform including solutions from automotive industry. The paper also discusses the roadmap for such a develop-

ment, including the test in terrestrial environments such as Antarctica. The paper will conclude with a proposal of a mission profile to illustrate the operational aspect.