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SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

Author: Mr. Diego A. Urbina
Space Applications Services N.V./S.A, Belgium

Dr. Jeremi Gancet
Space Applications Services NV/SA, Belgium
Mr. Karsten Kullack
Space Applications Services N.V./S.A, The Netherlands
Mr. Enrico Ceglia
Space Applications Services N.V./S.A, The Netherlands
Mr. Hemanth Kumar Madakashira
Space Applications Services N.V./S.A, Belgium
Mr. Joseph Salini
Space Applications Services N.V./S.A., Belgium
Mr. Shashank Govindaraj
Space Applications Services N.V./S.A, Belgium
Mr. Leonardo Surdo
Space Applications Services N.V./S.A, The Netherlands
Dr. Simeon Barber
Open University, United Kingdom
Dr. Simon Sheridan
Open University, United Kingdom
Ms. Janos Biswas
Technische Universität München, Germany
Mr. Philipp Reiss
Technische Universität München, Germany
Dr. Anthony Evangora
Dynamic Imaging Analytics, United Kingdom
Dr. Neil Murray
Dynamic Imaging Analytics, United Kingdom
Mr. Joseph Rushton
Dynamic Imaging Analytics, United Kingdom
Mr. Lutz Richter
OHB System AG, Germany
Ms. Diana Dobrea
OHB System AG - Munich, Germany
Mr. Mattia Reganaz
OHB System AG, Germany
Mr. Richard Aked
Space Applications Services N.V./S.A, Belgium
Mr. Craig Pitcher
United Kingdom

LUVMI: AN INNOVATIVE PAYLOAD FOR THE SAMPLING OF VOLATILES AT THE LUNAR POLES

Abstract

The ISECG identifies one of the first exploration steps as in situ investigations of the moon or asteroids. Europe is developing payload concepts for drilling and sample analysis, a contribution to a 250kg rover as well as for sample return. To achieve these missions, ESA depends on international partnerships.

Such missions will be seldom, expensive and the drill/sample site selected will be based on observations from orbit not calibrated with ground truth data. Many of the international science community's objectives can be met at lower cost, or the chances of mission success improved and the quality of the science increased by making use of an innovative, low mass, mobile robotic payload following the LEAG recommendations.

LUVMI provides a smart, low mass, innovative, modular mobile payload comprising surface and subsurface sensing with an in-situ sampling technology capable of depth-resolved extraction of volatiles, combined with a volatile analyser (mass spectrometer) capable of identifying the chemical composition of the most important volatiles. This will allow LUVMI to: traverse the lunar surface prospecting for volatiles; sample subsurface up to a depth of 10 cm (with a goal of 20 cm); extract water and other loosely bound volatiles; identify the chemical species extracted; access and sample permanently shadowed regions (PSR).

The main innovation of LUVMI is to develop an in situ sampling technology capable of depth-resolved extraction of volatiles, and then to package within this tool, the analyser itself, so as to maximise transfer efficiency and minimise sample handling and its attendant mass requirements and risk of sample alteration. By building on national, EC and ESA funded research and developments, this project will develop to TRL6 instruments that together form a smart modular mobile payload that could be flight ready in 2020.

The LUVMI sampling instrument will be tested in a highly representative environment including thermal, vacuum and regolith simulant and the integrated payload demonstrated in a representative environment.