

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

Author: Dr. Roland Trautner

European Space Agency (ESA), The Netherlands, roland.trautner@esa.int

Dr. Simeon Barber

Open University, United Kingdom, s.j.barber@open.ac.uk

Dr. James Carpenter

European Space Agency (ESA), The Netherlands, james.carpenter@esa.int

Mr. Richard Fisackerly

European Space Agency (ESA), The Netherlands, Richard.Fisackerly@esa.int

Ms. Berengere Houdou

European Space Agency (ESA), The Netherlands, berengere.houdou@esa.int

Dr. Mark Leese

Open University, United Kingdom, mark.leese@open.ac.uk

Mr. Andrea Rusconi

Leonardo S.p.A., Italy, andrea.rusconi@leonardocompany.com

Dr. Elliot Sefton-Nash

European Space Agency (ESA), The Netherlands, esefton@cosmos.esa.int

Mr. Andrea Zamboni

Leonardo S.p.A., Italy, andrea.zamboni@leonardocompany.com

PROSPECT: A NOVEL PACKAGE FOR SUBSURFACE SAMPLE ACQUISITION AND ANALYSIS
OF LUNAR VOLATILES**Abstract**

The Russian Luna-27 spacecraft (Luna-Resource lander) is scheduled to land in the Lunar south pole region in 2023. Among its payloads, it will carry a complex package provided by the European Space Agency which will support the extraction and analysis of Lunar surface and subsurface samples as well as acquisition of data from additional environmental sensors. The key elements of PROSPECT are the ProSEED drill and the ProSPA analytical laboratory. ProSEED will support the acquisition of samples from depths up to 1.2m and deliver them either to ProSPA or to Russian instruments. ProSPA will receive and seal samples in miniaturized ovens, and process them via heating, physical and chemical processing of released volatiles, and analysis of the obtained constituents via mass spectrometry. Additional sensors are foreseen to provide contextual information, such as cameras for the acquisition of multi-spectral images of drill working area and acquired samples, as well as temperature sensors and a permittivity sensor that are integrated in the drill rod. In our paper, we will first explain the rationale for the planned experiments and the implications of possible outcomes for lunar exploration. The PROSPECT system and its elements will be described and the key functionalities will be explained. The industrial and academic teams that perform the PROSPECT development will be introduced. Key engineering challenges will be highlighted, and the evolving operations concepts for PROSPECT as part of the Luna-27 payload will be introduced. The system's modularity and potential for re-use on different future exploration missions will be pointed out. An update on the status of the PROSPECT project and the Luna-27 host mission will be provided, and some of the challenges of managing and implementing the project in the framework of a wider European-Russian collaboration on Lunar Exploration will be explained.