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From Robotic to Human Exploration of the Moon: ILEWG roadmap

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Abstract

We shall discuss the rationale and roadmap of ongoing Moon missions, the required technologies, and how they can prepare for future human exploration.

Science rationale

Various fundamental scientific investigations can be performed with robots and humans: clues on the formation and evolution of rocky planets, accretion and bombardment in the inner solar system, comparative planetology processes (tectonic, volcanic, impact cratering, volatile delivery), records astrobiology, survival of organics; past, present and future life.

Enabling technologies

The roadmap includes also enabling technologies that prepare for the best synergies between robots and humans:

- Remote sensing miniaturised instruments; Surface geophysical and geochemistry package;

- Instrument deployment and robotic arm, nano-rover, sampling, drilling;

- Sample finder and collector, Support equipment for astronaut sorties;

- life science precursors for life support systems;

Concept studies for lunar landers

We discuss the results of a study for a lunar polar lander conducted at ESA CDF Concurrent Design Facility and follow up activities. The goal is to demonstrate lunar landing, survival and exploration technologies for the future, geochemical studies of the piles, and search for ice in permanent shadows.

We describe the top objectives, mission analysis, design and associated lander and rover. We also describe the possible payload complement in discussion with the community.

We also describe the rationale for Lunar Sample Return missions, and report on some ongoing concept of possible payload for large liunar landers.

Finally, we discuss the required advances in planetary robotics, required for both the polar lunar lander and for the sample return missions.

We shall address requirements for Robotic precursor programme, global robotic village, technology development, resource utilisation, human aspects, science and exploration from lunar sorties, transition towards permanent settlements and lunar bases.

Links:
http://sci.esa.int/smart-1/, http://sci.esa.int/ilewg/