

SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 3 (2C)

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HUMAN ASSISTED ROBOTIC VEHICLE STUDIES - A CONCEPTUAL END-TO-END MISSION  
ARCHITECTURE

**Abstract**

With current space exploration roadmaps indicating the Moon as a proving ground on the way to human exploration of Mars, it is clear that human-robotic partnerships will play a key role for successful future human space missions. This paper details a conceptual end-to-end architecture for an exploration mission in cis-lunar space with a focus on human-robot interaction, called Human Assisted Robotic Vehicle Studies (HARVeSt). HARVeSt will build on knowledge of plant growth in space gained from experiments on-board the ISS and test the first growth of plants on the Moon. A planned deep space habitat will be utilized as the base of operations for human-robotic elements of the mission. The mission will serve as a technology demonstrator not only for autonomous tele-operations in cis-lunar space but also for key enabling technologies for future human surface missions. The successful approach of the ISS will be built on in this mission with international cooperation, and mission assets such as a modular rover will allow for an extendable mission and to scout and prepare the area for the start of an international Moon Village. This paper is based on a response to a request for proposal issued by the European Space Agency (ESA) for the ESA Moon Challenge at the ESA International Symposium on Moon 2020-2030 in December 2015, in which HARVeSt was awarded the Second Prize and the People's Choice Award.