An ESA precursor mission to human exploration of the Moon

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The coming decades will once again see humans on the surface of the Moon. Unlike the Apollo missions of the 1960s this new lunar exploration will be an international effort, with long duration missions and a goal to pave the way for further human expansion into the solar system. Ensuring the success and sustainability of this exploration poses significant challenges for all involved.

ESA is currently preparing its first contribution to this international lunar exploration effort; a lunar lander mission, which will be a precursor to a future, Ariane V launched, ESA cargo and logistics capability to the Moon. The precursor mission will demonstrate soft precision landing with hazard avoidance capabilities, which will be required by a future cargo lander. In addition the mission can be applied as a preparation for future human exploration activities and help to ensure the sustainability of future exploration efforts. Activities have included Phase A and B1 mission design studies and technology development activities (both reported in another paper) and the definition of mission objectives and a model payload.

The mission objectives have been derived by the Lunar Exploration Definition Team, a group derived of European specialists in various areas of exploration related science and technology, supported by ESA. Major inputs to the definition process were the 195 responses received to a request for information for potential payload contributions to the mission. The group was tasked with establishing how such a mission could best prepare for future human exploration. It was determined that the mission's goal should be to enable sustainable exploration and objectives were identified within a number of themes: health, habitation, resources, mobility and scientific preparations for future human activities. Investigations seek to characterise the lunar environment (e.g. radiation, dust etc.) and its effects and the properties of a landing site (potential resources, geological context) as relevant to these areas and ensure the maturation of key technologies.

In this paper we discuss the objectives for the lunar lander mission and describe the model payload and the approach to selection and implementation of a final payload for the mission.