

Prelude to MoonVillage: Science and Innovation

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Abstract

We shall discuss the science goals, innovation, status of upcoming missions in the context of elaborating the concept of a Moon Village with the goal of a sustainable human presence and activity on the lunar surface [1-3] as an ensemble where multiple users can carry out multiple activities.

Previous MoonVillage projects

The Moon represents a prime choice for political, programmatic, technical, scientific, operational, economical and inspirational reasons. COSPAR and its ILEWG International Lunar Exploration Working Group (created 20 years ago) have been supporting opportunities of collaboration between lunar missions and exchange on future projects [4-8]. A flotilla of lunar orbiters has been deployed for science and reconnaissance in the last international lunar decade (SMART-1, Kaguya, Chang'E1&2, Chandrayaan-1, LCROSS, LRO, GRAIL, LADEE).

De facto, collaborative opportunities and elements of a Robotic Village on the Moon exist, as China landed in 2013 the Chang'E3 and its Yutu rover, and from 2017 other landers are planned (GLXP, Chang'E 4&5, SLIM, Luna 25-27, LRP, etc..). A number of human missions with Orion & ESA service module to lunar orbit, as well as private missions for humans and cargo are also planned.

Current missions for MoonVillage

We shall discuss roadmaps and technical studies held in international groups [4- 15] such as COSPAR, ILEWG, ISECG, IAF, IAA or national and regional groups (eg LEAG). We shall discuss the upcoming international and private lunar robotic and human missions and how they can address science, innovation and infrastructures to enable the vision and implementation of a Moon Village.

References

- [1] Jan Wörner, Driving #MoonVillage <http://www.iafastro.org/events/iac/iac-2015/plenaryprogramme/the-moon-a-continent-and-a-gateway-for-ourfuture/> (IAC 2015, Jerusalem);
- [2] <http://www.iafastro.org/events/iac/iac2016/globalnetworking-forum/making-the-moon-village-and-marsjourney-accessible-and-affordable-for-all/> (IAC 2016) ;
- [3] B. Foing et al , Highlights ESTEC Moon Village Workshop, <http://www.hou.usra.edu/meetings/lpsc2016/pdf/2719.pdf>, <http://www.hou.usra.edu/meetings/lpsc2016/pdf/2798.pdf>
- [4] P. Ehrenfreund et al. "Toward a Global Space Exploration Program: A Stepping Stone Approach" (Advances in Space Research, 49, n°1, January 2012), prepared by COSPAR Panel on Exploration (PEX)
- [5] http://www.lpi.usra.edu/leag/GER_2011.pdf;
- [6] <http://sci.esa.int/ilewg/47170-gluc-iceum11-beijing-2010lunar-declaration/>;
- [7] <http://www.lpi.usra.edu/meetings/leagilewg2008/>
- [8] <http://sci.esa.int/ilewg/41506-iceum9-sorrento-2007-lunar-declaration/>
- [9] National Research Council (2007), The Scientific Context for Exploration of the Moon
- [10] P. Ehrenfreund , B.H. Foing, A. Cellino Editors, The Moon and Near Earth Objects), Advances in Space Research, Volume 37, Issue 1, pp 1-192, 2006
- [11] <http://sci.esa.int/ilewg/38863-iceum8-beijing-2006declaration/>
- [12] W. Huntress, D. Stetson, R. Farquhar, J. Zimmerman, B. Clark, W. O'Neil, R. Bourke& B. Foing, 'The next steps in exploring deep space - A cosmic study by the IAA', Acta Astronautica, Vol 58, Issues 6-7, 2006, p302-377
- [13] <http://sci.esa.int/ilewg/38178-iceum7-toronto-2005-declaration/>
- [14] H. Balsiger et al. Eds, International Lunar Workshop, 1994 May 31-June 3, Beatenberg, Switzerland. Proceedings. Ed. European Space Agency, 1994. ESA-SP-1170
- [15] R.M. Bonnet et al, 'Mission to the Moon, Europe's Priorities for Scientific Exploration and Utilisation of the Moon', European Space Agency, ESA SP-1150, June 1992