A BLUEPRINT FOR AN INTERNATIONAL LUNAR ROBOTIC VILLAGE.

Leon Alkalai, Jet Propulsion laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.
Leon.Alkalai@jpl.nasa.gov

This position paper describes a vision of space exploration that places in its forefront a coordinated and concerted international effort, lead by the USA, towards the establishment of a permanent robotic presence on the Moon as part of a long-term effort to conduct ground-breaking and unique space science investigations coupled with first of a kind robotic demonstrations as precursors to future human expansion. Such a vision is consistent with and complementary to the recently announced redirection of the Human Space Flight (HSF) program away from the comfort zone of the Earth-Moon System and towards destinations such as a Near Earth Object (NEO) asteroid, a Lagrange point, or other destinations as stepping stones towards the ultimate human exploration of Mars. However, rather than giving the impression that the US has 'left' the Moon ('*been there done that*'), such a supplement to the proposed vision would send a clear and strong message to the US public and to the world, that, whereas our astronauts are taking on new and more ambitious exploration objectives (40 years after the initial landing on the Moon), our highly intelligent, autonomous and cooperative robotic systems are busy building and assembling an '*International Robotic Village*' that can host future robots from various international agencies, and also eventually host humans, when and if they chose to return. Such a coordinated and permanent science and exploration based robotic village has many advantages over an ad-hoc set of independent lunar robotic destinations, including:

1) Creation of an international testbed for the development and demonstration advanced mission operation architectures ranging from: human in the loop time-drive or event- driven command sequencing; human in the loop tele-operations; autonomous pre-programmed operations; or self-adapting machine learning systems with human supervisory control.
2) Demonstration of in-situ resource exploration using long-range mobility systems and in-situ measurement devices and instruments.
3) Robotic assembly of complex structures such as human or robotic radiation shelters, human habitats, modular structures, science stations for in-situ whether monitoring, scientific observatories, etc.
4) Bulk regolith movement and transfer using advanced mobility systems.
5) Sample manipulation, transfer and caching using advance robotic arms, end-effectors, sample canisters, etc.
6) The establishment of a central repository of common resources and utility services such as power sources, high-bandwidth telecom downlink, health monitoring, battery servicing and replacement, parts scavenging and repair using standard interfaces, etc.

The realization of such an international robotic village holds the prospects for galvanizing a new generation of young men and women to excel in math and science; such a vision can reach across international boundaries to generate international good will by fielding robotic systems designed by multiple nations, universities, high-schools, etc. Moreover, and perhaps most importantly, it would become a testbed for the demonstration of both robotic and human rated systems and services for the future exploration of more distant destinations such as Mars.

In this paper, I describe one instance of such a vision, in which NASA assumes international leadership for its ultimate realization.