

**PRESERVING EXPLORATION HERITAGE IN THE MOON 2.0 ERA.** P. J. Stooke<sup>1</sup>, <sup>1</sup>Department of Geography, University of Western Ontario, London, Ontario, Canada N6A5C2. Email: pjstooke@uwo.ca

**Introduction:** The new era of lunar exploration includes traditional space agencies and commercial interests. The first is more international in nature than the original era of exploration, which had only two superpower contenders. The second has roots in past concepts (Lunacorp, Applied Space Resources, Transorbital, Blastoff!) but has been galvanized by the advent of the Google Lunar X Prize (GLXP). Both have the potential to interact with artifacts from the first era of lunar exploration. Will this be positive or negative? What rules or guidelines exist, or might be invoked in future, to mediate this interaction? I suggest guidelines which would treat old sites with respect without placing unreasonable restrictions on future activities.

**Exploration heritage sites:** All sites from the first phase of lunar exploration are detailed in [1]. Some such as Luna 9 are known only within a few tens of km, while others like Apollo landing sites can be located to within a few meters. These sites include soft landings, failed landers, deliberate impacts of orbiters or descent vehicles, and sites which are unknown within the limits of orbital inclination (*e.g.* impact sites of the Apollo 16 Lunar Module ascent stage, or Luna 19).

But what counts as a ‘heritage site’? Early artifacts such as Luna 2, Luna 9, Surveyor 1 and Apollo 11, are obvious contenders. Does it follow that every such object should be preserved? Does a discarded braking rocket from a Surveyor deserve the same respect as the lander itself? Is a decade-old artifact as deserving as one from the 1960s? Opinions may range from complete protection to complete lack of regulation. Most nations preserve their major historical and cultural artifacts, and there is no reason exclude artifacts of lunar exploration. Diplomatic pressures may be involved if activities by one nation affect equipment from another nation. For these reasons a complete lack of regulation is not likely to be acceptable to most parties. Entrepreneurial explorers or potential developers may argue for minimal regulation, but they will also need protections for their own infrastructure, so again some level of protection will probably be acceptable to any likely participants in future lunar activities.

**Current regulation:** Until recently the lunar exploration hiatus made regulation unnecessary. Lunar historical parks were proposed two decades ago [2], to protect landing or impact sites out to the horizon visible from each site. Larger park reserves would be set up around poorly located sites and reduced if the site was found later. This is probably more than is neces-

sary or desirable today. Other more formal proposals have been made recently [3, 4].

Space agencies involved in future exploration will probably respect the artifacts of other nations as a matter of diplomacy. Less clear is the likely behavior of private entities such as participants in the GLXP, as prize money is available specifically for viewing heritage sites. The only precedent is the case of Transorbital, Inc.'s Trailblazer mission, planned for launch in 2001 but not flown. Apart from FCC and State Department approval, Transorbital also required a permit from NOAA to fulfill US treaty obligations. NOAA was especially interested in the disposal of the orbiter at the end of the mission. It had to crash well away from any heritage sites. Viewing hardware from the surface may require similar safeguards guaranteed in advance, but the US situation is not clear today, and many GLXP contenders may not be US entities. Should nations or agencies with lunar artifacts (originally the US and USSR, now also ESA and Japan, soon India and China) draw up their own rules separately, or should the effort be international, through the UN or UNESCO? And will regulations be too restrictive?

**Guidelines and example:** I propose minimally restrictive guidelines for near-term activities, while formal arrangements are debated. All sites from the first lunar exploration era (1959-1976) and the first sites associated with new moon-faring agencies, regardless of age, should be protected. Protection should encompass artifacts themselves and areas directly affected by activities (footprints, rover tracks, bounce marks, debris fields). The protected area should allow close approaches to artifacts or tracks (*etc.*) for observation if nothing is disturbed. As an example, Figures 1 and 2 show the Apollo 17 site at Taurus-Littrow. Figure 1 shows how the Apollo site can be approached from landing areas a few km distant without crossing old tracks or footprints. Figure 2 shows that approaches to within 20 m of the LM, or perhaps closer, can be made from the north or south without any disturbance at all to the site. Thus, GLXP heritage viewing is not incompatible with protection given suitable planning.

**References:** [1] Stooke P. J., 2007. *The International Atlas of Lunar Exploration*. Cambridge: Cambridge University Press. [2] Stooke, P. J., 1988. Abstr. 2nd Conf. Lunar Bases and Space Activities of the 21st Century, Houston, TX, April 5-7, 1988. LPI Contribution 652, p. 234. [3] O’Leary, B. L., 2006. *Antiquity*, 80:307., March 2006. [4] Capelotti, P.J., 2004. *Archaeology Magazine* 57:6, Nov-Dec 2004.

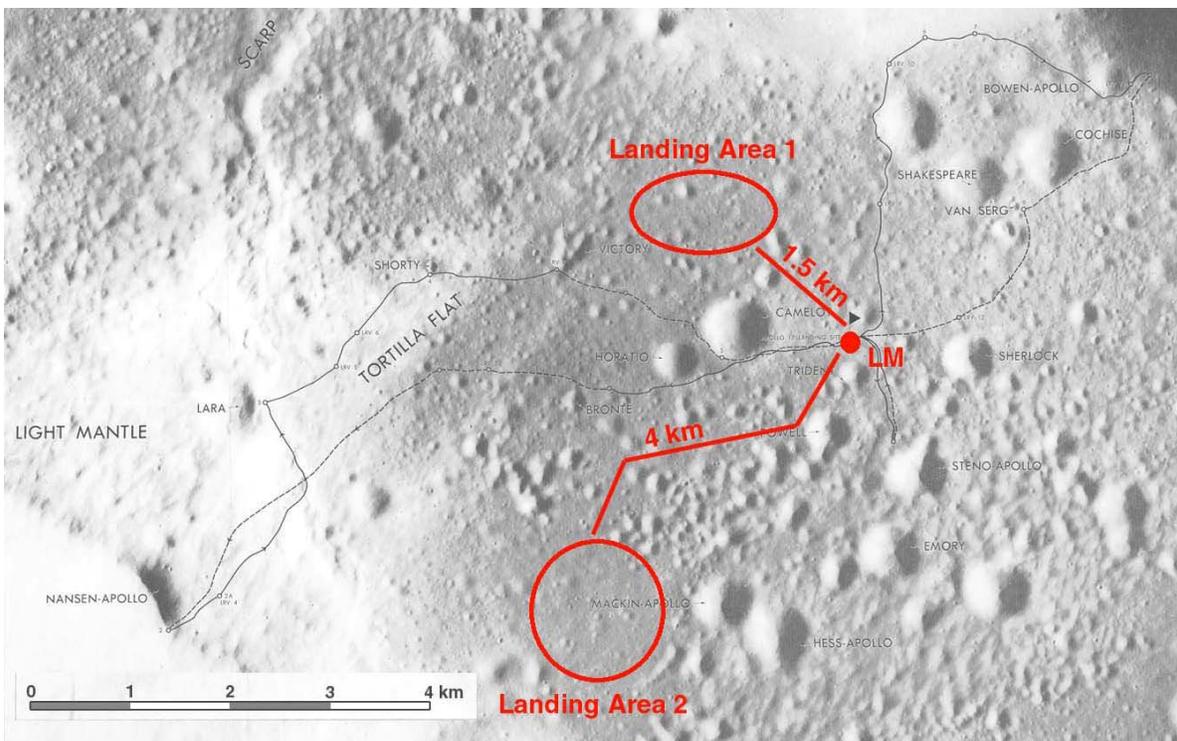


Figure 1. Potential landing areas and approach paths for the Apollo 17 site, designed not to cross old rover tracks.

Defense Mapping Agency map 43D1S2(25) – Apollo 17 Traverses, 1975.

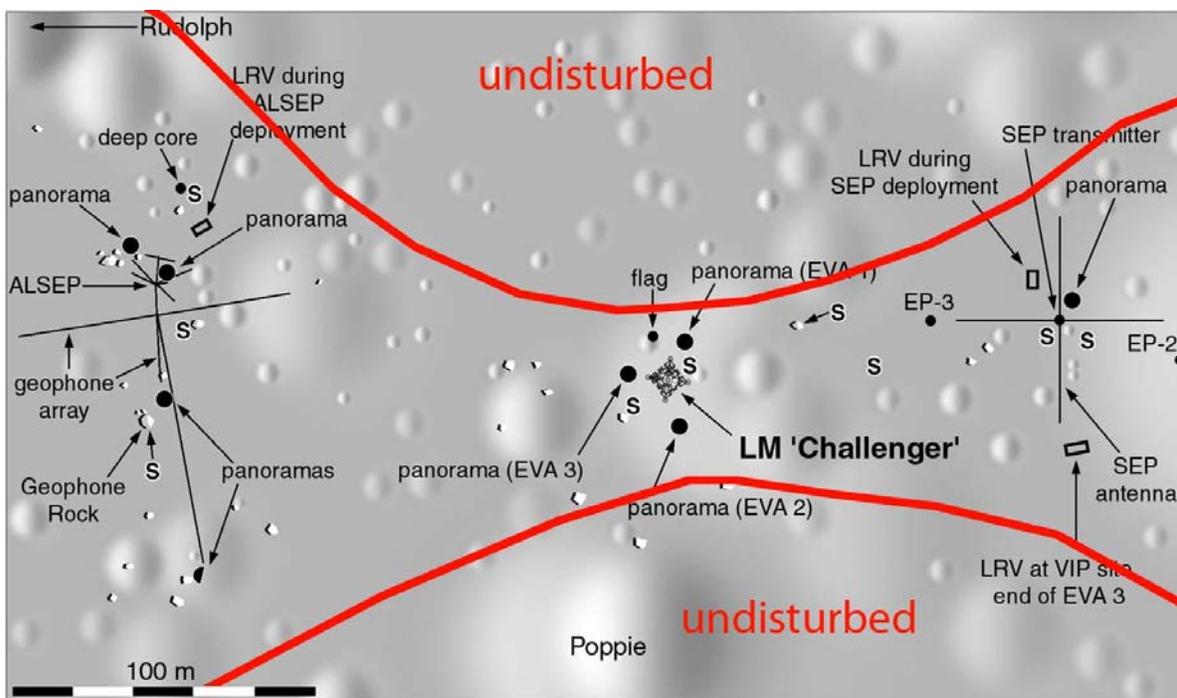


Figure 2. Undisturbed zones near the Apollo 17 LM, ALSEP and SEP areas. Traverses from the north and south could approach to within 20 m of the Lunar Module without crossing any tracks or footprints.

Map by P. Stooke from [1] with additional annotation.