LUNAR LAVA TUBES: A POTENTIAL OPTION FOR FUTURE HUMAN HABITATION ON THE LUNAR SURFACE. L. W. Tombrowski[1] and A. A. Mardon[2], [1 2]Antarctic Institute of Canada (Post Office Box 1223, Station Main, Edmonton, Alberta, Canada T5B 2W4, aamardon@yahoo.ca).

Introduction: For the past several years it has been suggested that the next manned mission to the Moon could make use of lunar lava tubes as habitable shelters and/or storage areas. The lava tubes on the moon would provide protection against cosmic radiation, micrometeriods, meteorites, and other natural hazards while also providing a habitable environment with relatively stable temperatures compared to the wildly fluctuating day/night temperatures on the Moon's surface.

Benefits: There are numerous potential benefits to building a manned lunar base inside a lava tube. Due to the more stable temperatures in the tube, space suits and base modules would not require as extensive of temperature regulation systems as on the surface of the moon. This would allow astronauts a greater degree of freedom of movement while inside the tube. Eliminating the need for bulky insulation also means a lunar base only requires pressurization, therefore improving the size and portability of base components (this is assuming that the risk of debris falling from the roof of the tube is negligible). The protection from cosmic radiation inside the tubes presents the possibility of a long-term manned lunar mission without the need for as extensive of shielding from radiation. Lunar lava tubes may also provide the opportunity for mining operations and geological study from directly beneath the Moon's surface. Study of the tubes themselves may provide clues as to how the Moon was formed.

Further Study: More information on the exact structure and location of lunar lava tubes is required. At the present moment, only observational evidence has been found to support the existence of lava tubes on the Moon. Unmanned missions using lunar rovers and/or probes must be conducted in advance of a manned mission in order to determine the suitability of a tube for human habitation. Research must also be conducted in order to determine safe and efficient methods of moving supplies, astronauts, and other equipment in and out of the tube. Due to a lower gravity and absence of atmosphere, lunar lava tubes could be significantly larger than lava tubes on Earth.

Seismic Activity: The exact cause and intensity of seismic activity on the moon is currently unknown. Therefore, study on the seismology of the Moon must be conducted in order to measure the potential risk of a lava tube collapsing or debris falling from the ceiling of a tube. Methods for safely clearing the floor of a tube of debris, boulders, or other potential obstructions must also be looked into.

Power: Considering the scenario where the main base and living quarters are located inside of a lunar lava tube, options for power generation and storage would have to be examined. If the power is generated from outside the tube (e.g. solar panels), an appropriate power transfer system and backup system must be established inside the tube, or vice versa if power is generated inside the tube.

Conclusion: The usage of lunar lava tubes for human habitation and/or storage in future manned missions to the Moon is largely theoretical at this point in time. There are unquestionably great potential benefits to the concept, however a considerable amount of study and further unmanned missions to the Moon will be required before any conclusions regarding the viability of the tubes can be reached.

References: [1] G. De Angelis et al. (2002) *LPS XXXIII*, Abstract #1417. [2] Y. Cheryl Lynn et al. (1992), "Lunar lava tube sensing", *Lunar and Planetary Institute, Joint Workshop on New Technologies for Lunar Resource Assessment*, 51–52