LUNAR ROADS: STRATEGIES FOR REMAINING IN THE SUNLIGHT. D. S. Plata[1], Space Development Network, developspace1@gmail.com.

Introduction: The slow rotation of the moon on its axis results in lunar nights lasting about 14 Earth days. This poses a significant challenge to robotic exploration due to the lack of solar power and the need for the hardware to survive the cryogenic temperatures of the lunar night.

Because of the slow rotation of the moon on its axis, lunar days are also 14 Earth days long. Telerobots could construct basic lunar roads by compacting the regolith. In this context, they could also increase their lunar day by driving in a westerly direction. The speeds necessary to remain at a the same time of lunar day appear within reach of telerobots by driving west at high latitudes.

The Challenge: The moon's slow rotation on its axis results in long lunar nights of about 14 Earth days. The resulting lack of solar power creates the challenge of surviving the lunar night [1]. During this time, solar power is lost, temperatures plummet, and power requirements may increase in order to provide body heat. However, the moon's slow rotation also increases the length of the lunar day.

Speeds Necessary to Remain in Lunar Daylight: To remain at the same time of day on the moon, vehicles would have to drive west at 15.4 km/hr at the equator, 10.4 km/hr at 45 degrees latitude, and 8.0 km/hr at 58.5 degrees latitude. For comparison, the Apollo rovers were designed with a maximum speed of 12.9 km/hr with the maximum speed measured at 18.0 km/hr.

Strategies for Developing a Network of Lunar Roads: This paper examines the question of how telerobots could be used to create a network of roads starting at the poles and extending towards the equator. Basic lunar roads could simply involve the compressing of regolith in order to reduce the amount of dust kicked up when vehicles pass over them. These roads could be of use for exploration and resource development.

Strategies for remaining within the sunlight include driving from the poles in the morning, and then making longitudinal roads while driving west. As sunset slowly develops, the telerobots could drive back towards the poles at higher speeds using the very roads that they created and then either head west at speeds greater than the moon's rotation or even pass over the pole to morning on the other side of the moon.

Challenges to Overcome: Challenges for the implementation of this approach are discussed including maintaining the telerobots operating in the setting of abrasive regolith dust [2], ensuring that the telerobots are adequately charged, and maintaining communications between Earth and the telerobots [3,4].

References: [1] Ungar E. and Fruitwala N. (2011) AIAA SPACE 2011 Conference & Exposition, AIAA SPACE Forum. [2] Hyatt M. et al. (2007) 45th AIAA Aerospace Sciences Meeting and Exhibit, Aerospace Sciences Meetings. [3] Farquhar R. W. (1967), JSR, Vol. 4, No. 10, pp. 1383-1384. [4] Malmström et al. (2006) Space 2006, AIAA SPACE Forum, https://doi.org/10.2514/6.2006-7453.