

Adaptation of Mining Methods for Low- and Micro-gravity Environments: Part 1

Leslie Gertsch

Missouri University of Science and Technology

Title: Deputy Director, Rock Mechanics and Explosives Research Center

Email: GertschL@mst.edu

Telephone: 573.341.7278

This paper reports the first stage of a study of the effects of low gravity (such as on the Moon and Mars) and microgravity (on asteroids and comets) on the efficacy of several representative terrestrial mining methods. The purpose is to evaluate their adaptability for use in space. Future papers will report on the effects of inimical or no atmosphere, and of other environmental aspects of mining in space, using a similar procedure.

The mining methods were first broken down into their component unit operations, which were then classified according to their gravity dependence. Secondly, the nature of the gravity dependence will be evaluated to determine whether, and how, the required gravity effects could be replaced to achieve similar results. This may require changes to other unit operations that do not themselves require Earth gravity for nominal operation. The third stage will re-formulate the mining methods for space use, and predict their efficiency relative to each other using carefully formulated simulations. Finally, the knowledge gaps made apparent by the exercise will be tabulated to form the basis of a research roadmap. This paper discusses the results to date of the study.