Paper ID: 6274
student

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support and EVA Systems (6)

Author: Mr. Ehsan Taheri
K.N. Toosi University/Aerospace Research Institute (Ministry of Science, Research and Technology), Iran

Mr. Aidin Mohammadi
Aerospace Research Institute, Ministry of Science, Research and Technology, Iran
Prof. Mehran Mirshams
K. N. Toosi University of Technology, Iran
Prof. Mohsen Bahrami
Aerospace Research Institute, Iran

APPLICATION OF JET PACKS FOR LUNAR EXTRAVEHICULAR ACTIVITIES /EXPLORATIONS

Abstract

In this paper a novel method for traversing over the moon surface is proposed. Lunar Roving Vehicles (LRVs) were 4-wheeled rovers used on the Moon during the last three missions of the Apollo program in the early 1970s. These vehicles were capable of traversing the lunar surface, allowing the astronauts to extend the range of their surface extravehicular activities (EVA). Furthermore, this invention greatly expanded the range of the lunar explorers. Although, the Lunar Rover proved to be the reliable, safe and flexible vehicle it expected to be, the traversing time of these vehicles was quite long. The rovers had a top speed of about 13 km/h. In addition, the LRV does not have the capability to probe deep valleys. On the other hand they are heavy vehicles. In this paper, as a solution to the mentioned associated problems of LRVs, a novel approach for easy and efficient travel over the moon surface and inside valleys is suggested using jet packs. Jet or rocket packs are various types of device, usually worn on the back, that use jets of escaping gases to allow a single user to fly. The jet can provide significant thrust from fairly lightweight rockets. Application of these devices on Earth has had major drawbacks due to the existence of atmosphere and high gravity acceleration. But these are no more obstacles over the Moon surface. These devices allow an individual to safely travel or leap over short or long distances. The pilot can vector the thrust by altering the direction of the jet nozzles through hand-operated controls. The cylinders of fuel and oxidizer and jet nozzles can be attached to the spacesuit and replaced easily. By the combination of different motions of lever handles the pilot can fly any way. Applicability of typical current jet packs for lunar EVA is assessed in terms of total distance, total time, longest single traverse, maximum range from a lunar module using a simple constant gravity acceleration model neglecting Moon's curvature as well as a minimum energy two-point boundary value Lambert problem. Solutions to this problem revealed outstanding results in terms of travel time per distance traveled and supporting life time efficiency for astronauts. Applicability of this method of for inter-colony transportation is also studied considering technological advances.