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LUNAR EARTH COMMUNICATION: A CONSTELLATION OF RELAY SATELLITES

Abstract

Since the beginning of human space exploration, there are hundreds of missions that are designed and launched for the Moon in order to study Earth's natural satellite. These Space Science missions to the Moon have revealed amazing facts about Solar System and Moon itself. Many researchers have concluded that "The surface of the moon is like a window into the early history of our solar system". Earth's Moon is the 5th largest moon among more than two hundred moons in our Solar System and lies in a circumstellar habitable zone that makes it an ideal choice for a future human colony. However, for such a colony to exist; one of the most important key factors is the communication system. This paper presents a comprehensive study on Lunar Relay System that would allow seamless communication services to and from Lunar assets. A permanent outpost on Moon will enable more effective future exploration of Mars and other destinations. In the light of recent discoveries, it has been found that Moon has water molecules present in the depth of the craters of the shadowed regions. The south pole of the Moon features completely shadowed regions that can be utilized to set up a permanent base. However, the location of this outpost possesses a challenge for direct communication with Earth. In order to overcome this challenge, a relay system will be necessary to provide communication services between Earth and Moon. The Lunar Relay System is a conceptual design consists of low-cost constellation communication satellites deployed in Halo orbits around the Earth-Moon Lagrange points that can provide complete coverage of the Lunar south pole. A preliminary conceptual satellite and its subsystem design will be discussed in detail along with the astrodynamics revolving around it. Comprehensive tables and graphs will be given, which will depict the amount of time that will pass at each mode of travel and more importantly some idea on the cost in terms of energy, as well as money, will be discussed within today's context. In addition to this, this paper will take into account, the habitable sites on the south pole of the Lunar surface and the prerequisites to such an advanced communication system.