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HUMAN EXPLORATION OF THE MOON AND MARS SYMPOSIUM (A5)
Going Beyond the Earth-Moon system: Human Missions to Mars, Libration points, and NEO's (4)

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SIGNIFICANCE AND FEASIBILITY ANALYSIS OF HUMAN MISSION TO MARS

Abstract

Human exploration to Mars is a hot topic of aerospace domain. It has been studied for decades and has attracted more interest in recent years. Mars is the most similar planet to Earth and has the most possibility for human landing, so many program of future manned deep space exploration focus on Mars. This study analyses significance and feasibility of manned Mars mission. Firstly, the objectives and significance of the mission is discussed. Both the enthusiasts and skeptics' viewpoints are represented. The positive aspects of Mars exploration program supported by the enthusiasts are summarized, including exploration, national pride international prestige, scientific investigation, human evolution, international cooperation, technology advancement, education inspiration, economic benefit, etc. While, the skeptics do not agree to these supportive aspects and their doubts mainly focus on what is the benefit/cost comparison for robotic vs. human exploration, and whether the objectives and significance is worthy of the risk of human life. The comparison of positive and negative viewpoints indicates that manned Mars mission is of great significance for human race, but has enormous expense and difficulties. Secondly, the feasibility of sending humans to Mars is analyzed. Compared with manned lunar mission, Mars mission has much longer duration and much greater scale. The major difficulties of human exploration to Mars are analyzed. Then the key technologies of the mission are summarized, including launch, propulsion, Mars AEDL (aerocapture, entry, descent landing), crew supporting, power, robotics, communication, automatic assembly, etc. The study indicates that human exploration to Mars is a mission of large scale, high risk, great difficulty, and enormous cost. There is still argument in rationale for this mission. Implementation of this program need further strategy demonstration, roadmap programming, and a great deal of key technologies to be overcome.