Nuclear Thermal Rockets: Mars and Beyond

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As the interest grows and people become more determined to travel to Mars and beyond, the need for efficient rockets has also increased and become more pressing. Traditionally, chemical rockets have been the top choice for space travel because we are familiar with the technology and they are readily available. However, as the distance and time of flight are increasing, chemical rockets are becoming less efficient and less capable. In NASA's Human Exploration of Mars Design Reference, nuclear thermal rockets (NTRs) were proposed as the primary method to travel to Mars. In this project, using researched data, the specifics of chemical and nuclear thermal rockets are used to calculate the minimum amount of propellant needed based on the ideal rocket equation, and the ratio of the masses of propellant and rocket for comparison. A program was then developed to compute the trajectory and orbital elements to enhance the results from the previous calculation, and a second program was developed to confirm that the results are accurate and realistic. The results showed that nuclear thermal rockets have a significantly lower propellant to rocket mass ratio than chemical rockets, indicating that nuclear thermal rockets are nearly twice as efficient as chemical rocket. In the future, the project will expand to include more realistic missions to Mars, possible methods to minimize time of flight, and the exploration of the nuclear reactor suitable for space travel.

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