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Author: Mr. Gang Hong
Beijing institute of Astronautical Systems Engineering, Beijing, China

Mr. Feng QI
Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation
(CASC), China

NUCLEAR THERMAL ROCKET: A REACHABLE AND EFFECTIVE PROPELLING SOLUTION
FOR SPACE EXPLORATION PROJECTS

Abstract

The main object of this article is to analyze the possibility and key technical points about space vehicles and its propelling subsystem based on nuclear thermal propelling conception. It is well known that chemical propellant has occupied to be the most important choice to accelerate spacecrafts for decades. But chemical-propellant-based rockets or spacecrafts have an obvious limitation on its size and total impulse of engines because of the specific impulse of their propellant. The most effective chemical propellant is liquid hydrogen and liquid oxygen, with its specific impulse 450s, which depress space engineers in deep space exploration, especially in manned space exploration projects.

Within many innovative conceptions and projects about future space vehicle, nuclear thermal rocket seems more practicable and easier to carry out. Its specific impulse of its single engine can reach 900s, more than double of that of traditional chemical engine. So our research team has made a deeper study on nuclear thermal engine and on the design of nuclear thermal rocket. In this article, some principle conclusions will be shown in nuclear thermal research, such as the structure of nuclear reactor, nuclear-to-thermo structure design, the analysis on the difference of engine cycling types, payload capability, etc. As the inspiring result, we has found that the big-thrust nuclear thermal engine can be made in seeable future with worldwide cooperation and, based on this kind of engine we can design available nuclear thermal rocket to carry long-distance space exploration mission, for example, the travels between Earth and Mars.