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RESEARCH ON CRITICAL TECHNOLOGIES FOR EARTH-TO-MARS SPACE TRANSPORT VEHICLES BASED ON NUCLEAR-THERMAL PROPULSION

Abstract

After many years' discussion and fundamental research,the exploration solutions based on spacecrafts with nuclear-thermal propulsion has gained advantages out of many exploring plans on Mars,and,has been recognized the most possible way from Earth to Mars. Nowadays the nuclear-thermal-propelling spacecrafts to Mars attracts more and more attention in main space countries. And the demonstrations of space flight with peaceful usage of nuclear power seem to come into truth in seeable future. This paper discusses the common critical technologies for Earth-to-Mars spacecrafts with nuclear-thermal propulsion based on the previous researth and the analyses in realizing these technologies,including energy-propulsion integral design tecnology,high-effiency nuclear-thermal transformation technology, thrust control technology,general structure design technology, long-duration-on-orbit propellant restoration technology and spacecraft environmental protection technology. And in this article,the principles and risks for energy-propulsion integal design,nuclear-thermal efficiency promotion methods,the reliability in thrust control and principles in structure design,reliable propellant restore method and optional environmental protection tecnologies will be put forward. And the proposed general design principles are included at the end of this article.