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## THERMAL MANAGEMENT SYSTEMS FOR SMALL SATELLITE ORBITING MARS INCORPORATING NANO-TECHNOLOGIES

### **Abstract**

The UAE has set a long term goal to establish a settlement in Mars by 2117. The development of first mission to Mars with an orbiter was launched in July-2020 named as Emirates Mars Mission. More missions will be planned to achieve the ultimate goal of the 100 years plan. With the development of space technologies, small satellites i.e. CubeSats have been contributing easier access to the space, advanced scientific exploration and reduced mission costs, along with being approved to be capable for deep space missions. High-power small satellites have the potential to provide new and advanced capabilities; however, the thermal management brings significant challenges to apply these capabilities in small satellites where the thermal dissipation technologies are still lacking. This research aims to analyze and propose a new concept for heat dissipation using nano-fluids in a loop heat pipe with a deployable radiator for deep space exploration mission. While these techniques have been demonstrated on larger satellites, the current trend is to develop a miniaturized system for small satellite applications. The addition of nanoparticles to conventional heat transfer fluid can dramatically increase its thermal performance due to the increased thermal conductivity of the nanoparticles, whereas the deployable radiator will offer significant enhancements in the thermal dissipation due to increase in the radiating area. This analysis was performed on a 6U CubeSat model, with generic CubeSat components.