인공위성 단기액체 추진시스템의 열적 성능특성

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Thermal behavior of spacecraft propulsion system utilizing monopropellant hydrazine (N_2H_4) is addressed in this paper. The thermal-control performance to prevent propellant freezing in spacecraft-operational orbit was test-verified under simulated on-orbit environment. The on-orbit environment was thermally achieved in space-simulation chamber and by the absorbed-heat flux method that implements an artificial heating through to the spacecraft bus panels enclosing the propulsion system.

Spacecraft propulsion system is composed mostly of mechanical components, that means there are rarely electrical heat dissipation in itself. The components of propulsion system which contains hydrazine shall include heater circuits to keep away from the unwanted cold situation. Besides, all the components are to be completely enclosed by MLI (Multi-layer Insulation) blanket except for thrusters only. Differently from the other bus components whose temperature is controlled by the heaters located nearby, each propulsion component has its own heaters to ensure the prevention of freezing. This necessitates a number of heaters accommodated to propulsion system.

Test results obtained in terms of temperature history of propulsion components are presented and reduced into duty cycles of the avionics heaters which are dedicated to thermal control of those components. The duty cycles are subsequently converted into the electrical power required in the operational orbit. Additionally, cyclic temperature of each component, which was made during thermal-balanced condition of spacecraft, is compared to the acceptable design range and justified at the view point of system verification.