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A GROUND-BASED TEST METHOD FOR SPACESHIP ACTIVE THERMAL CONTROL SYSTEM

Abstract

Active thermal control system, that performs heat collection, heat transport and heat dissipation for the whole spacecraft, is one of the key subsystems in thermal control system. Hereafter, in this paper, a ground-based test method was presented to investigate a single-phase fluid loop in spacecraft. This method simultaneously accounted for flow resistance and heat transfer characteristics of fluid in the loop. The whole system consisted of model loop, cold source and data acquisition system. The main emphasis was to realistically simulate the radiator in space flight with low cost. A counter-flow heat exchanger together with cryogenic refrigerator was used to act as radiator for the whole loop. And heaters placed on cold plates served as heat loads. Experimental results shown that this method fully simulated the loop in real flight condition. Both temperature and pressure agreed well with flight data. Based on this system, performance of fluid loop can be conveniently studied in design-phase with thermal balance and thermal vacuum test, which decreased dramatically the cost and time of spacecraft development.