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THE DEVELOPMENT OF SPACE AUTONOMOUS RENDEZVOUS AND DOCKING OF CUBIC
SATELLITES FOR IN-ORBIT CONSTRUCTION MISSION

Abstract

With the maturity of CubeSats technology, the cubic satellites can be used individually or stacked as a complex system to meet the needs of specific missions. Enlightened by some in-orbit mission like CPOD and RACE, Two 12U cubic satellites were designed, aiming to perform the Rendezvous and Docking on orbit. Based on the technical parameters and performance features of the payloads of the cubic satellites, such as chemical propulsion, camera and laser range finder, this paper presents firstly the concept of rendezvous and docking experiments with the 800m distance. Working mode with current issue and limitation at different approach stage was studied. The detailed simulation verified successfully that the Rendezvous and Docking can be achieved by using guidance, navigation and control (GNC) technology. Based on the above simulation result, further research focused on how the mission and CubeSats were designed, which taken orbit, positioning, inter-satellite communication, the power consumption, fuel consumption and thermal effect into account. Besides, GNC ground demonstration experiment was carried out by means of using two 6 Degrees of Freedom (DoF) simulator as Target and Chaser separately. Particularly, a novel electromagnetic docking mechanism was present in this paper. Result of the verification and demonstration experiment can provide technical support for the development of the orbit construction with cubic satellites, such as large aperture earth observation system.