

50th STUDENT CONFERENCE (E2)
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AN OVERVIEW OF THERMAL TESTS FOR CUBESATS

Abstract

To maintain the integrity of CubeSats due to the hard launch and the harsh space environment, spacecraft need to pass different thermal tests. However, nowadays, most CubeSat programs are considered low priority and the tests are mainly conducted to meet the launch requirements. The reliability and the success of the mission are less important than meeting the thermal and mechanical requirements from the launch provider. Because of this fact, multiple CubeSats programs do not perform an appropriate testing sequence which could potentially reveal any possible in-space hazards. The tests listed below are required to estimate satellite survivability under an in-orbit thermal environment and certify the absence of human errors and material defects. The most common CubeSat thermal tests are Thermal Balance Test (TBT), Thermal Vacuum Cycling Test (TVCT), and Bake-out Test. Each of the following tests is crucial for the success of CubeSat missions and it is an efficient design verification method. The tests verify that a CubeSat can be fully operated and can survive to extreme temperature in orbit. The goal of this paper is to describe the extreme space environment specifically for Low Earth Orbit (LEO) CubeSat missions, to propose a thermal testing sequence for educational nano satellites, and to present the trade study performed on different thermal tests. The parameters which have been considered for the trade study are cost, time, feasibility, and reliability. All the advantages and disadvantages for every thermal test have been identified and discussed. Ultimately, this paper aims to give to the audience the required knowledge and tools to build an efficient and successful thermal testing plan for educational miniature satellites.