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Author: Ms. Akansha Raman
University of Petroleum and Energy Studies, India

Ms. Yashika Paharia
University of Petroleum and Energy Studies, India

CHIPSAT DEPLOYMENT: CHALLENGES AND OPPORTUNITIES

Abstract

The evolution of progressive research and development has compelled and elicited curiosity on emerging issues of satellites. The substantial downscaling of spacecraft size and mass made possible by the reduction of electronics and mechanical components has resulted in a massive paradigm for spacecraft design with enormous redundancy. A circuit board containing a number of sensors, a solar panel, an onboard computer, and a communication system make up these tiny miniature satellites referred to as ChipSats. Due to various limitations, future missions with ChipSat will be a challenging feat. By enhancing the capabilities of its low-power nanocomponents, flexible modular design, and tolerance for individual unit failure, the use of a multi-satellite subsystem known as a "swarm" of ChipSat can improve research and commercial applications.

The influence of the challenges and restrictions in deployment and autonomous control on ChipSat are all analyzed in this research paper. Implementing autonomous relative motion control to maintain the appropriate spatial configuration of the satellites, maneuver to a desired relative orbit, and correct naturally occurring relative drift is one of the key concerns while integrating a flight formation mission. The ChipSat will have a tiny magnetorquer for this purpose. The decentralized strategy has been chosen, in which ChipSat will choose a pair to halt the relative drift between them. The most important fundamental characteristic of a satellite is its communication strategy. ChipSats need robust and adaptable communication subsystems that facilitate the reconfiguration of the key operational parameters including carrier frequency, transmission power, and bandwidth. Telecommunications technology, which transmits and receives data in the form of optical signals, has been optimized to accomplish all of these objectives. This is advantageous due to its higher information-carrying capacity than other technologies. Due to the Earth's extreme circumstances, the atmospheric entry of ChipSat is a challenging task. The ballistic coefficient takes an important role in this paper's parametric evaluation of the atmospheric entry of ChipSat. The advent of this fuel-free satellite will contribute to more scientific advancement in overcoming impending challenges and offer better prospects for future development.