19th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Earth Observation Missions (4)

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HIGH-TECH MICROSATELLITES AND THEIR POSSIBLE EXPLOITATION

Abstract

The use of microsatellites in the field of space application is becoming more and more widespread in the last years, as witnessed by recent studies. Such space systems, defined as satellites having a mass lower than 100kg, have been used in past mainly as a technology demonstrator, or to complete mission requiring low-level performance. Currently, noteworthy advances in the many fields of technologies either devoted or not to space application, open new, uncovered scenario in the exploitation of micro-satellites. The continuous reduction of dimensions of electronic devices coupled with increasing capability, and the miniaturization of physical equipment on the other hand (like micro-propulsion system), give the possibility to have on board equipment capable to provide the spacecraft with performance significantly higher if compared with the small mass. In this paper, we propose an innovative concept of microsatellite configuration: we will think a microsatellite as a performing platform, able to carry out operative missions, satisfying stringent requirements. The stringent mission requirements imposed by valuable mission to perform can be satisfied through the implementation of cutting-edge technology (also devoted to terrestrial application, thus not necessarily space-qualified); one of the added values these microsatellites can offer to space exploitation is the possibility to design a constellation in order to provide valuable services that a single spacecraft cannot provide. Such a methodology is based on three main aspects: the mission to accomplish and the consequent stringent mission requirements; the technological innovations used to provide the performances capable to satisfy the mission set; the responsiveness in having the microsatellite deployed in space, e.g. through an air-launch. These three pillars can be balanced in order to have, for example, a technological demonstration mission to exploit the capability of innovative technologies, placed in orbit with an air-launch; or a microsatellite where the focus is on the mission requirements and the technology to satisfy such requirements, with a classical launch To prove the capability of such a methodology, several possible microsatellite mission are studied, among which an Earth Observation mission will be investigated in detail, describing the stringent requirements (e.g., in terms of revisit time), designing a micro-satellite architecture which comprise the capability and the performance offered by technological innovation, and designing the most suitable solution.