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IMPACT OF SOLAR PANELS ORIENTATION ON THE POWER BUDGET: CASE OF MICROSATS

Abstract

In all space missions, the power for these spacecraft's relies on solar panels of different types. It is recalled that there are solar panels, which are fixed to the body of the satellite, and orientable solar panels, which are used on satellites with high power demand, such as radar satellites. Low Earth Orbit Observation Satellites operate in an SSO orbit, one of the main microsatellites bus limitations is the available on-board power. The orientation of the solar panels is one of the problems encountered in the design of satellites, so that maximum energy can be provided to the spacecraft. This is particularly important in low orbit Earth observation (LEO) satellites because the fixed solar panels cannot be continuously oriented towards the sun. An interesting alternative is the use of orientable panels, which provide constant power during the orbit daylight. However, this option involves the use of motors or flexible cables to power a moving mechanism, etc., which can decrease the reliability of the system. Deployable and reorienting structures in orbit have always proven their value and are widely used, especially their varied applications in the space sector which opens up new functionalities and allows energy and space savings. The orientation mechanisms of satellite solar panels allow the deployment of large surfaces for solar panels while occupying a reduced volume under the launcher fairing. The objective of this research project is to develop an analytical formulation and a solution to the problem due to the orientation effect of fixed solar panels for Earth observation satellites in low circular orbit. The calculation of the optimal orientation of fixed solar panels to the body of a microsatellite during its lifetime, from the point of view of average power, will be presented. Finally, an application of these procedures to an Earth observation microsatellite will be developed and performed.

Keywords Solar panel, low orbit LEO, microsatellites, orientation analysis, on-board power.