MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Environmental Effects and Spacecraft Protection (6)

Author: Mr. Bustanul Arifin
Indonesian National Institute of Aeronautics and Space (LAPAN), Indonesia, bus_ar@yahoo.com

Mr. Abdul Karim
Indonesian National Institute of Aeronautics and Space (LAPAN), Indonesia, karim.lapan@gmail.com

THE APPROPRIATE TECHNIQUE FOR THE MICROSATELLITE HARDWARE DESIGN IN LINE WITH THE REDUCTION COST: MITIGATION THE RADIATION EFFECTS OVER A MICRO SATELLITE FLYING IN LOW EQUATOR ORBIT

Abstract

Space technology and space environment are two subjects that closely related each other. The strong relationship among them is triggered by how the space environment affects the spacecraft design. Since situation in space is harsh and entirely different with the environment on the ground surface, the spacecraft Engineers must consider the environment of space effects as designing a satellite; thus, it will capable of operating in its orbital environment. Truthfully, the adverse condition in space may degrade the satellite subsystem.

For the developing countries as a new player in space sector, mainly of which lie on the Equator such as Brazil and Indonesia, the facets of space environment is not just the only problem encountered in developing a spacecraft, but also the budget matter. Reduction space mission cost as a solution has become one of the most interesting subjects in how to design satellite with the lower budget, and already have been applied by developed and emerging countries. This approach enable space program more affordable by all nations.

This paper will highlight an appropriate technique for micro satellite hardware design, particularly to mitigate the radiation effects over a micro satellite flying in low equatorial orbit (500-1000 km) in line with the reduction space mission cost, intending to the Equatorial Countries as the main player. Firstly, the space radiation has been set up as the cost driver for our technical approach, representing all group space environment effects during Mission Definition phase. The analysis results of the radiation impact on space hardware, then, have been successfully obtained. Afterwards, they have been transferred into cost implication phase by analyzing and comparing the existing cost reduction methods, either the traditional or radical cost reduction method. In order to strengthen our outcome, several study cases of space hardware design have been involved in. Moreover, in term of the mission orbit, the Equatorial orbit has been determined in the beginning process.

Although our mitigation technique has been produced in line with the reduction cost, the analysis process has been also concerning of the aspect of reliability and performance. Its reliability is limited not to be lower and the performance is still into the acceptable range. The final result of our technique is expected will provide a design guideline for the spacecraft Engineer in how to overcome/minimize the radiation environment effect on space hardware, notably for a micro satellite which flies in the Equator orbit.