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STRUCTURE MODELLING AND OPTIMAL CONFIGURATION OF A MICROSATELLITE IN EQUATORIAL ORBIT

Abstract

LAPAN-A5 is the first microsatellite to be launched as part of the Indonesia Low-Earth Orbit (LEO) communication satellite constellation. The main objective of the missions is to provide real-time data communication from existing sensors used in the disaster management system in Indonesia. The constellation is also planned to provide Automatic Identification System (AIS) data for ship monitoring and ADSB for air traffic monitoring at the equatorial zone. 9-satellites in a constellation are designed to have a similar platform to accelerate the development time for completing the whole constellation. The constellation will be placed on a 0-deg equatorial orbit which leads to a different environment that will be experienced by the satellite compare to those in polar orbit. This requires the satellite, particularly the structure, to be designed in such a way to be able to meet the mission requirements and constraints. The study presented in this paper focuses on LAPAN-A5 structure design and optimization. The key of the design is to meet the mission requirement to have compatibility with two launch vehicles under consideration while maintaining the overall mass under 100 kg. To meet this requirement, honeycomb sandwich panels which consist of two aluminum faces and an aluminum honeycomb core are implemented as the primary structure to reduce the satellite mass. The satellite bus will be equipped with a propulsion system hence the design of satellite configuration shall minimize the shift of the center of mass and meet the moment of inertia requirements from the AODCS subsystem. The finite element modeling, simulation, and analysis are used for validating the design configuration. The result leads to an optimal configuration of a microsatellite in equatorial orbit constellation.