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Author: Mrs. LORENA CARDENAS
Aerospace Technology Investigation Center - Fuerza Aérea Colombiana, Colombia,
lorena.cardenas@fac.mil.co

Mr. Sergio Fernando Barrera Molano
Aerospace Technology Investigation Center - Fuerza Aérea Colombiana, Colombia,
sergiomaguu@gmail.com
Mrs. Sonia Rincón
Colombian Air Force, Colombia, sonia.rincon@fac.mil.co
Dr. Jesus Gonzalez-Llorente
Colombia, jdgonzalezl@ieee.org
Mr. Francisco Luis Hernández Torres
Universidad del Valle - Cali, Colombia, francisco.hernandez@correounivalle.edu.co
Prof. Julian Rodriguez-Ferreira
Universidad Industrial de Santander, Colombia, jgrodrif@uis.edu.co
Prof. Ignacio Acero
UNIVERSIDAD SERGIO ARBOLEDA, Colombia, ignacio.acero@usa.edu.co
Ms. MAIRA CAMILA PABA MEDINA
Universidad Industrial de Santander, Colombia, mairacami@hotmail.com
Mr. Cristian Arango
Universidad del Valle - Cali, Colombia, arango.cristian@correounivalle.edu.co
Mr. Dib Salek
Aerospace Technology Investigation Center - Fuerza Aérea Colombiana, Colombia, zsalekc@gmail.com
Mr. Javier Enrique Mendez Gomez
Aerospace Technology Investigation Center - Fuerza Aérea Colombiana, Colombia, javier8670@yahoo.es
Mr. Santiago Muñoz Giraldo
Aerospace Technology Investigation Center - Fuerza Aérea Colombiana, Colombia,
santiagomo76@gmail.com
Mr. GERMAN SAENZ
Aerospace Technology Investigation Center - Fuerza Aérea Colombiana, Colombia, gsaenz194@gmail.com
Mr. Juan José Echeverri
Universidad del Valle - Cali, Colombia, juan.chriboga@correounivalle.edu.co
Prof. Carlos Fernando Quiroga Ruíz
Universidad del Valle - Cali, Colombia, carlos.quiroga@correounivalle.edu.co
Dr. Jairo Antonio Valdés Ortíz
Universidad del Valle - Cali, Colombia, jairo.valdes@correounivalle.edu.co
Dr. Peter Thomson
Universidad del Valle - Cali, Colombia, francisco.hernandez@correounivalle.edu.co

ADVANCES IN LEOPAR MISSION DESIGN: THE COLOMBIAN SATELLITE BASED ON A CUBESAT 3U BUS FOR EARTH OBSERVATION

Abstract

LEOpar mission is developed under the joint space engineering project that is formed by the alliance between the Aerospace Technology Investigation Centre (CITAE) of the Colombian Air Force (FAC) and three Colombian universities. The purpose of this mission is to create national capacities in satellite technologies by developing a CubeSat 3U model with a hyperspectral camera as a payload for Earth observation. The satellite mission uses the MISC-3 satellite bus from Pumpkin Inc, which after its acquisition, was stored for some time and requires diagnostic tests. At the same time, the design of the mission follows the phases of space missions to attend to the needs of the country and to identify the requirements of the payload that is being developed in the project.

The project requires a non-traditional methodology because it follows the space mission engineering process, but at the same time a satellite bus is available that requires diagnostic testing. This article presents an overview of the diagnostics and test process developed on the satellite bus, which requires functional test and analysis by simulation for verification of its capabilities; difficulties, test development times, test personnel, equipment, software and other requirements for the diagnostics performed are described. It describes the concept tests in the on-board computer programming, analysis of mechanisms and structures, mass verification, verification of the power system, battery status and status of the actuators and sensors of the attitude determination and control systems, as well as simulations that allow knowing the thermal conditions of the satellite bus.

Additionally, some conclusions are presented once the tests have been completed, for example, for the OBC subsystem, it has been possible to establish the total percentage of energy consumption that guarantees the adequate performance of the platform and the fulfillment of the mission. On the other hand, the tests performed on the platform's battery bank showed a poor performance, making it necessary to replace it with others of higher capacity. The structure was verified based on simulations of the vibration environments and the load states of the satellite bus.