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LOWRCANSAT: LOW COST WATER ROCKET CANSAT

Abstract

LoWRCanSat is the acronym for Low Cost Water Rocket CanSat, an undergraduate educational project based on the CanSat payload standard. This learning experience will be one of the most relevant "hands-on" assessments of the capstone courses of the Minor in Fundamentals of Aerospace Engineering at Pontificia Universidad Catolica de Chile (PUC), along this 2018 year.

This aerospace pedagogical experience gives the students the opportunity for a balanced learning about the four main areas of the Astronautical Engineering (Spacecraft, Orbit-Trajectory, Launch System and Telecommunications & Control).

The novelty of LoWRCanSat regarding other CanSat experiences is related to the low-cost components and simplicity, mainly driven by the proposal of a reusable water rocket as launching vehicle, unlike the chemical ones frequently used. The total cost of the mission shall be below US$150.

The Spacecraft is, as the standard claims, a nano computer with all the necessary subsystems fitted inside a simple soda can, with a mass below 350g, which will be deployed when the rocket reaches maximum altitude, and land softly on the ground thanks to a parachute. A Raspberry PI microcomputer has been selected for the OBC of the LoWRCanSat, with a Raspberry PI Camera as payload.

The Orbit-Trajectory part of the mission will be composed by the calculus of the CanSat time of flight, angle of launching, parachute resistance to wind and similar topics.

The proposed Launch System for this experience is mainly a two-part water rocket composed by a complete and a half soda bottle, launched from a solid metal platform. The deployment system consists in a simple servo motor arm, commanded by the student's mobile phone, and a small parachute.

Telecommunications & Control will be carried out by the WIFI connection of students' mobile phones, which also demands good programming skills to link it with the OBC hardware.

As outcomes of the experience, we expect to have real time images captured by the payload and received by a ground-based computer. For the analysis of results after the field tests, will be considered key variables as reached altitude (more than 30 m are expected), time of CanSat flight, image quality and engineering design.

This paper addresses the method and work plan for the LoWRCanSat learning experience.