SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
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TELEMETRY AND DATA ACQUISITION PLATFORM FOR SOUNDING ROCKET LINKED TO A GROUND STATION

Abstract

In recent years, the number of space-related activities in Costa Rica has grown as a result of efforts by academic, governmental and industrial organizations. As part of this movement, the Central American Association for Aeronautics and Space (ACAE), a nonprofit organization, leads projects aimed at developing technical skills amongst students, start-ups, and established companies. The mechanical engineering department of the University of Costa Rica has also initiated a "Aerospace Camp", where students, engineers, scientists, and amateur rocket enthusiasts can come to launch their rockets. Generally speaking, the experiments conducted at the camp were divided into three groups: (1) Measurement of physical Earth variables; (2) Measurement of the rocket's dynamic behavior; and (3) Experiments requiring the special conditions found at high altitudes.

In order to transmit the data collected from the experiment to a ground station, an electronic data acquisition and transmission system for the rocket was designed, built and tested. The communications system consists of three key elements: Inertial Measurement Unit with 11 degrees of freedom; transceivers for three distance ranges; and an ARM M4 Microcontroller. This system establishes communication with a ground station and its software, a complementary project to the system proposed in this paper and that has also been submitted as to this conference with the title "Real-time data acquisition platform using the OpenRocket simulator".

This paper outlines the design and integration of these three essential hardware components, as well as the performance of the rocket-ground station communication link. Focus was given to academia in order to support experiments at the Costa Rican Aerospace camp dealing with the rocket-ground station transmission link.

The primary experiment presented here is the tracking and prediction of the rocket's trajectory. These data is transmitted to the ground station and used to analyze the performance of the various launch vehicles. Additionally, digital imaging onboard the rocket will be used to evaluate algorithms and peripherals to assist future missions at the Aerospace camp.

The data acquisition platform outlined in this paper aims to become a fundamental tool to evaluate the performance and behavior of rockets under real launching conditions. This tool will help expose future students and professionals to aerospace technologies in order to develop knowledge and contribute to the aerospace industry in the Central American region.