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Small Satellite Operations (3)

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GROUND STATION IN THE ANTARCTIC

Abstract

The Center for Research in Aerospace Technologies (CITAE) of the Colombian Air Force -COLAF, in search of activating the capabilities in satellite communications, implemented the first phase of satellite communications in the Isabel Riquelme Islet of Rada Covadonga -Base General Bernardo O'Higgins (Antarctica), for which design criteria were defined for one (1) week of operation, restrictions and functional and non-functional requirements of a Temporary Earth Station, which was composed of a satellite tracking system based on the TLE and corroborated with the Gpredict monitoring software, an antenna system and a communication system (HAM Radio), the reception of telemetry beacons sent by the FACSAT-1 nanosatellite in downlink communication and received in the Antarctic territory.

In order to give continuity to this project, it is planned to develop a Temporary Earth Station with longer operating times than one week, which meets the basic requirements for Antarctic conditions, which allows Telemetry and Telecommand (TMTC) communication and additionally the downloading information from the satellite payload from the Antarctic continent; this implies the development of capacities by the COLAF and specifically the CITAE in fields such as the design and manufacture of antennas, development of applications with Software Define Radio (SDR) and implementation of communication protocols for nanosatellites such as the CubeSat Space Protocol (CSP) to operate in extreme environments.

Communication with the FACSAT-1 nanosatellite from the Antarctic territory solves to a great extent: the telemetry and payload information download speed, with up to six (6) passes per day thanks to its geographical position with respect to the polar orbit; possibly the effective communication time increase to download information due to the topography of the place; identify in extreme environments, the performance of the materials (limited in the wiring) and the limitations in the movement of the rotors; and the effectiveness of the control of the Antarctic station, from the central base located in Colombia.