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STUDENT DESIGN AND DEVELOPMENT OF EARTH OBSERVATION NANOSATELLITE: ALBERTASAT-1

Abstract

This paper addresses the design and developmental process of a Nano-Satellite to by an interdisciplinary team of undergraduate, graduate and post-graduate students at the University of Alberta. The Satellite, AlbertaSat-1, is the University of Alberta's entry in the Canadian Satellite Design Challenge (CDSC); an initiative to entice Canadian students to contribute to the space technology and research industry. The opportunity provides many students with the ability to achieve hands on experience and goals that previously were not available in Alberta. Both the educational and academic impacts will be profound.

AlbertaSat-1 is an earth observation satellite to be launched into LEO sometime in early 2013, where it will use Visible and Near-Infrared sensors to classify and analyze snow, ice, land, water and vegetation properties (ie. NDVI; snow/ice extent and differentiation; Net Primary Productivity; land/water contrasts). A robust control system using three reaction wheels is being developed for the precise control requirements of the sensors and optimal solar cell orientation. A secondary space physics sensor has been proposed for observing some aspect of solar radiation or plasma physics, however, this is tentative based on resource (monetary, time power) availability and allocation. Also being developed are communications and data-handling subsystems catered to the bandwidth and power requirements of the sensors. All will be housed in a modified 3U-cubesat structure with a deployable solar array to optimize the power input for a dusk/dawn orbit. AlbertaSat-1 will be put through rigorous stages of design and environmental testing to ensure functionality in the harsh environment of space. Other requirements for the competition include public awareness and an outreach program.

AlbertaSat-1, while being an excellent education tool, also provides a template for future cost effective small satellite missions. Relying totally on sponsorship and donations, AlbertaSat-1 must find the most cost effective solutions to nearly all problems. Partnership with The University's Nano-Fabrication Laboratory will provide access to state of the art facilities for producing novel and function specific products. A student budget mentality must be considered, as the satellite is fully student designed, developed and organized. Although only the winning candidate(s) will be launched as part of the CSDC, we will plan to acquire funding and resources to launch regardless of the outcome of the competition. AlbertaSat-1 will become the first of many initiatives from the region to access space, so it is necessary that the mission becomes a successful foundation to build from.