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Studying the Lower Thermosphere with Alberta's First Cube Satellite: Ex-Alta 1

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Ex-Alta 1 is the pioneer cube satellite for the AlbertaSat team at the University of Alberta and will be the first built-in-Alberta satellite. This 3U cube satellite is designed and assembled primarily by volunteer undergraduate students at the U of A, with guidance from several researchers and faculty members. In this way, AlbertaSat offers a unique opportunity to train highly qualified personnel for eventual careers in aerospace.

Ex-Alta 1 is one of two Canadian satellites participating in the QB50 mission coordinated by the Von Karman Institute in Brussels, Belgium. It will be deployed from the International Space Station in the autumn of 2016. Thus, its initial orbit will be at an altitude of 400 km and inclination of 52°. Once in orbit, Ex-Alta 1 will study space weather, using a range of scientific instruments, and will act as a qualification opportunity for the first model of a new suite of open source cube satellite subsystems being developed at the University of Alberta.

Ex-Alta 1 is equipped with three scientific payloads. The multi-Needle Langmuir Probe (mNLP) experiment, developed at the University of Oslo, will study variations in ion densities. These measurements can be used to better quantify how the Earth's atmosphere expands and contracts into low Earth orbit. The mNLP will also enable the collection of information to study the effects of re-entry. A Digital Fluxgate Magnetometer (DFGM) developed and built at the U of A will be deployed at the end of a 60 cm boom and will study the Earth's magnetic field in low Earth orbit. Finally, a radiation dosimeter onboard Ex-Alta 1 will measure variation in radiation levels in low Earth orbit, thus giving insight into average electron and proton flux during the mission. Data generated by Ex-Alta 1 will be curated by teams at the University of Alberta and the Von Karman institute and made available to the scientific community.

Ex-Alta 1 will also include the Athena on-board computer. This on-board computer for cube satellites is a fully open source system designed and built by senior undergraduate students at the University of Alberta. It will be tested and qualified on the Ex-Alta 1 mission, and will then form the foundation for future cube satellite projects carried out by the AlbertaSat team.

Author: Mr NOKES, Charles D. A. (University of Alberta)

Co-authors: Mr HAMILTON, Alexander D. (University of Alberta); Mr BRUNER, Brendan (University of Alberta); Dr LANGE, Carlos F. (University of Alberta); Mr ROBSON, Christopher (University of Alberta); Mr CUPIDO, Collin (University of Alberta); Dr SAMEOTO, Dan (University of Alberta); Mr BARONA, David (University of Alberta); Mr MILES, David M. (University of Alberta); Dr ELLIOTT, Duncan G. (University of Alberta); Dr MANN, Ian R. (University of Alberta); Mr GREY, John P. (University of Alberta); Prof. WYARD-SCOTT, Loren (University of Alberta); Mr ROBERTSON, Matthew T. (University of Alberta); Dr FLEISCHAUER, Michael D. (National Institute for Nanotechnology); Ms FERRARI, Ruth (University of Alberta); Mr DAMKJAR, Stefan (University of Alberta); ALBERTASAT, Team (University of Alberta); Mr HRYNYK, Tyler (University of Alberta)

Presenter: Mr NOKES, Charles D. A. (University of Alberta)

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