

System Design of a 3U-CubeSat for an Earth Observation Mission

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ABSTRACT

This paper provides a detailed description of the Educational Space Science and ENgineering Experiment (ESSENCE) mission's system design of a 3U- Earth Observation CubeSat. This CubeSat will be designed, built, and operated by Canadian Students for scientific research related to attitude control laws, and monitoring permafrost in the Northern Canadian and Arctic regions. The ESSENCE mission would be launched from the International Space Station (ISS) via a US launch provider called NanoRacks. Moreover, the CubeSat would be operated by students located at Canadian ground stations. The scope of this paper is to discuss the key concepts regarding systems engineering which are required to design a successful CubeSat mission. Some of the concepts include project scope, mission analysis and development of key engineering budgets. Other concepts also include discussions regarding component selection via trade study analysis. These factors often drive the mission and aid other subsystem such as mechanical, electrical, RF communication etc. to make decisions for tasks exclusive to them. Furthermore, an implementation plan of an optical payload will be discussed to capture high resolution earth images of the desired location mentioned above. Lastly, a comparison of two key system design methods will be discussed including waterfall and agile methods.

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