UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF MISSION CONTROL UNIT PROTOTYPE FOR SMALL CLASS PAYLOADS

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ABSTRACT

Small satellites are experiencing rapid advancement where various missions are proposed. There are increasing trend in nanosatellite launches as the year progresses especially from 2012 to 2015. Since the introduction of low-scale satellites, many companies have emerged to support these projects, proven by establishment of many university spin-off companies worldwide. However, most of the commercial companies provide expensive on-the-shelf solution, which is a big disadvantage for the universities, specifically due to the limited source of funds to start up their own space program through the launch of their first satellite. In some countries, explorations in space-related research are still limited due to high cost of designing, developing, testing, and launching a satellite. To develop it in their own, knowledge in developing and integrating all the subsystems are very important. Therefore, this project proposed a low—cost platform, integrated with multiple sensors and Mission Control Unit (MCU) prototype that can be used to demonstrate the application and engineering concept of satellite. In this project, Arduino based control unit with real-time data logger that can control and retrieve scientific data from various sensors are developed on a 2U CubeSat platform for classroom demonstration purposes. The prototype will be able to perform many mission themes comprising earth observation, scientific, communications and technology over amateur radio frequency spectrum with the same protocol and modulation technique used by the low-cost Ham radio transceivers at ground station. This product has high commercialization potential, especially to schools and universities that would like to start their space program. The current prototype is designed to have flexibility of having any sensors integrated to it in future. It can be improved and integrated with other subsystems to produce a space qualified spacecraft model.

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CHAPTER 1

INTRODUCTION

1.1 Overview of Study

Today, satellite becomes an important role in daily life. The applications of satellite have been extended from the fields of television broadcasting to the fields of remote sensing, weather forecasting and military areas. The space technology has advanced rapidly in recent years via that application. There are many researches done by space-related researchers that lead to the innovation of small satellite. Year by years, the innovation has achieved great success as a way to efficiently construct and orbit small, compact and inexpensive satellite. Since the achievement, many companies worldwide attracted and emerged to support this project. Figure 1.1 and 1.2 shows the examples of successful small satellite innovation.

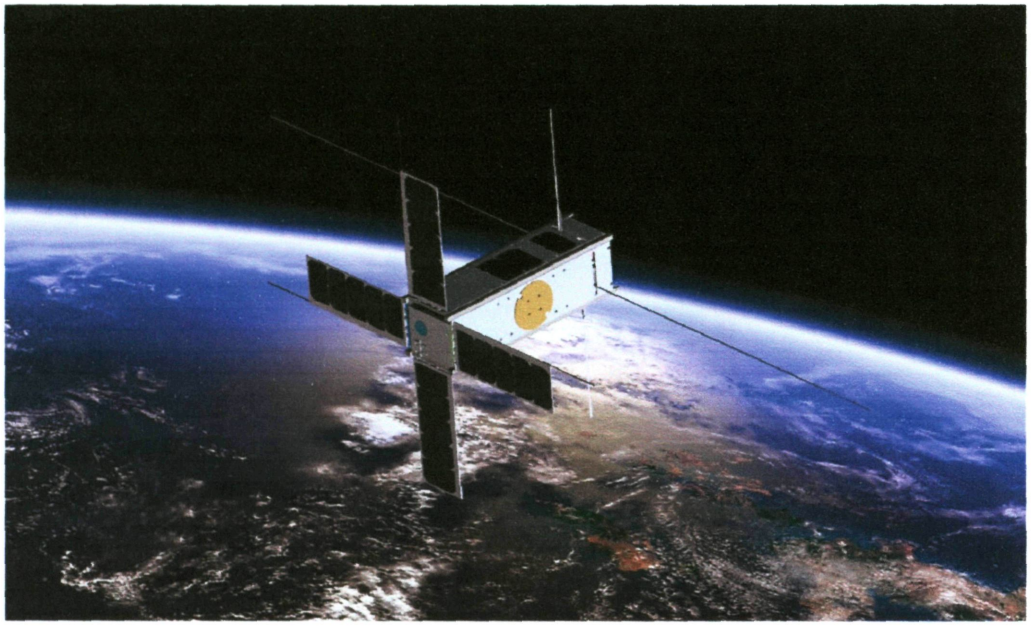

Figure 1.1: Picasso CubeSat