

Proceedings of the Annual General Donald R. Keith Memorial Conference

West Point, New York, USA

April 30, 2015

A Regional Conference of the Society for Industrial and Systems Engineering

Black Knight II

**Mallory Herron, John Marotti, Lucas Ruff, Benjamin Young, Andrew Huang, Rachel Oliver,
Alberto Squatrito, Roger Burk, Matt Burrow, and Brodie Hoyer**

Department of Systems Engineering
United States Military Academy
West Point, New York

Email: mallory.herron@usma.edu

The views expressed herein are those of the author and do not reflect the position of the United States Military Academy, the Department of the Army, or the Department of Defense.

Author Note: A special thanks goes to LTC Matt Burrow, Dr. Roger Burk, and MAJ Brodie Hoyer for advising the Black Knight II (BKII) team through such a rigorous project and providing the proper funding to make this project possible. The team has worked hard to get to this point and will continue to strive forward in order to send a satellite into space in the near future.

Abstract: The Black Knight II (BKII) project is the second year of a multi-year program to design, build, and test West Point's second CubeSat satellite. It will integrate commercially available CubeSat components through a multidisciplinary approach to design, structure, and validate a 2-unit (2U) CubeSat platform capable of thermal profiling and accommodating future payloads. In the fall of 2014, the BKII team decided that the payload would be a set of thermocouples to develop thermal profiles of smaller CubeSats in-orbit. The team determined the necessary components by generating alternatives through the use of the engineering design process, selected a design, ordered parts, and ran a Computer Automated Design (CAD) analysis on the model to ensure that when tested, the unit would not fail. In the spring of 2015, the BKII team's purpose and end goal slightly shifted. Due to cost and lead times, many of the desired components did not arrive in time to send the CubeSat to the Massachusetts Institute of Technology Lincoln Labs (MITLL) for validation and environmental testing. The BKII team developed an alternative plan to properly set next year's team up for success. For the electrical team, the focus was to test the thermocouples, validate the ground station, demonstrate the configuration of the radio equipment for easy setup upon its arrival, and develop test plans for every component. The mechanical team's focus was to model the CubeSat and its components while running vibration testing, to develop a solution for attitude control, and to print three-dimensional models of the components that are on order to integrate into the chassis upon its arrival. This project will be very beneficial to the CubeSat community as it will be the first CubeSat to collect thermal profile data while in-orbit, allowing future designers to develop more accurate thermal models of their own spacecraft.

Keywords: Black Knight II, CubeSat, Thermal Profiling