



www.DeepakPublishing.com

Swartwout, M. (2013): JoSS, Vol. 3, No. 1, pp. 265-281
(Peer-reviewed Article available at www.jossonline.com)



www.JoSSonline.com

The Colorado Student Space Weather Experiment (CSSWE) On-Orbit Performance

David Gerhardt¹, Scott E. Palo¹, Quintin Schiller², Lauren Blum², Xinlin Li², and Rick Kohnert²

¹ University of Colorado at Boulder, Aerospace Engineering Sciences, Boulder, CO, USA

² University of Colorado at Boulder, Laboratory for Atmospheric and Space Physics, Boulder, CO, USA

Abstract

The Colorado Student Space Weather Experiment (CSSWE) is a three-unit (10cm × 10cm × 30cm) CubeSat funded by the National Science Foundation and constructed at the University of Colorado (CU). The CSSWE science instrument, the Relativistic Electron and Proton Telescope “integrated little experiment” (REPTile), provides directional differential flux measurements of 0.5 to >3.3 MeV electrons and 9 to 40 MeV protons. Through a collaboration of more than 60 multidisciplinary graduate and undergraduate students working with CU professors and engineers working in the Department of Aerospace Engineering Sciences and at the Laboratory for Atmospheric and Space Physics (LASP), CSSWE was designed, built, tested, and delivered in three years.

On September 13, 2012, CSSWE was inserted into a 478km × 786km, 64.7° inclination orbit. After a 20-day commissioning phase, the REPTile instrument was enabled, providing high quality, low noise science data return that is complementary to the NASA Van Allen Probes mission, which launched two weeks prior to CSSWE. To June 2014, the CubeSat had downlinked data from 426 days of on-orbit science operations, well past its full mission success goal of 90 days of science operations.

Although operations continue, the CSSWE team is focused on analysis of the on-orbit data. The CSSWE attitude converged to the local magnetic field within one week of launch using a passive magnetic attitude control system. Satellite interior temperatures were found to remain within their design range, even during multi-week periods of insolation. However, not all systems behaved as expected: CSSWE experienced four on-orbit anomalies over the first nine months of the mission. The student-led CSSWE team has grown in experience and knowledge throughout design, build, test, delivery, launch, and operations of this small satellite. An overview of the CSSWE system, on-orbit performance, and lessons learned is presented, with a focus on the first nine months on-orbit.

Corresponding Author: David Gerhardt - dtgerhardt@gmail.com

Publication History: Submitted – 07/12/13; Revision Accepted – 08/3/14; Published – 08/14