

SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
In Orbit - Postgraduate Space Education (4)

Author: Dr. Jeremy Straub
North Dakota State University, United States

Mr. Andrew Jones
North Dakota State University, United States

AN UPDATE ON THE OPENORBITER I MISSION

Abstract

The OpenOrbiter mission is demonstrating the efficacy of and beginning to space-qualify the 1-U CubeSat designs of the Open Prototype for Educational Nanosats (OPEN). OPEN is a set of hardware designs, software, assembly instructions and testing plans that will be made freely available online, facilitating very low cost production of a CubeSat. Currently, the basic OPEN design (excluding payload) can be built for a parts cost of US\$ 2,500. The designs and instructions allow production by third party vendors (e.g., PCB fabrication) and students with the capabilities of a typical engineering undergraduate (e.g., component attachment, structure fabrication).

This presentation provides an update on the OPEN designs, as the spacecraft readies for launch and orbital operations in 2017. Specifically, the final designs for the electrical and mechanical systems are presented. Particular focus is paid to changes that have been made during the fabrication and testing process and the rationale for these changes is discussed. The operations plan for the spacecraft is presented, with focus on how the Global Star-based radio that has been added for this initial flight will facilitate the verification of other onboard systems.

With the spacecraft designs presented, focus then turns to a discussion of their utility for educational purposes. In this area, results from student surveys are presented and the areas of identified benefit and benefit attribution are tied back to spacecraft design decisions. The key benefit areas of OPEN are evaluated based on this context, with the benefit of design customizability being specifically considered. Techniques to get teams up-and-building faster (which drives student excitement) are also discussed. The results of the OpenOrbiter program are juxtaposed with data from an international survey of CubeSat student participation benefits.

The paper concludes with a discussion of future pathways, both for the OPEN design and the OpenOrbiter program. Techniques that have and are being developed to simplify mechanical fabrication are presented. Longer term goals of the OpenOrbiter program, including outreach to other schools and aiding the start of other programs, are discussed. Several additional missions, at various phases of development, are discussed. The educational and technical value presented by each mission is briefly considered.