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SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
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CANADIAN ADVANCED NANOSPACE EXPERIMENT 2 ORBIT OPERATIONS: ONE YEAR OF PUSHING THE NANOSATELLITE PERFORMANCE ENVELOPE

Abstract

The objective of the Canadian Advanced Nanospace eXperiment (CanX) program is to develop highly capable nanospacecraft, or spacecraft under 10 kilograms, in short timeframes of 2-3 years. CanX missions offer low-cost and rapid access to space for scientists, technology developers, and operationally responsive missions. The Space Flight Laboratory (SFL) at the University of Toronto Institute for Aerospace Studies (UTIAS) has developed the CanX-2 nanosatellite that launched in April 2008. CanX-2, a 3.5-kg, 10 x 10 x 34 cm satellite, features a collection of scientific and engineering payloads that push the envelope of capability for this class of spacecraft. The primary mission of CanX-2 is to test and demonstrate several enabling technologies for precise formation flight. These technologies include a custom cold-gas propulsion system, a 30 mNms nanosatellite reaction wheel as part of a three-axis stabilized momentum-bias attitude control system, and a commercially available GPS receiver. The secondary objective of CanX-2 is to fly a number of university experiments including an atmospheric spectrometer. After one successful year in orbit, the nanosatellite has met or exceeded all mission objectives and continues to demonstrate the cost-effective performance capabilities of this class of spacecraft. Key achievements to date include a characterization of the propulsion system, a full demonstration of the attitude determination and control system including capabilities in accurate payload pointing (including nadir-tracking) and orbit-normal alignment, long-duration reaction wheel operation, unprecedented radio performance for an operational nanosatellite, and successful science operations. The mission, the engineering and scientific payloads, and a discussion of notable orbit achievements and experiences of CanX-2 are presented in this paper.