Abstract

Design, assembly, integration, and testing of a power processing unit for a cylindrical Hall thruster, the NORSAT-2 flatsat, and the Vector Gravimeter for Asteroids instrument computer

Adam Ladislav Svatos
Masters of Applied Science
Graduate Department of University of Toronto Institute for Aerospace Studies
University of Toronto
2017

This thesis describes the author’s contributions to three separate projects.

NORSAT-2 is the fifth satellite to be constructed by the Space Flight Laboratory (SFL) for Norway. The Norwegian Space Centre (NSC) and Space Norway are leveraging the development of NORSAT-1 to enable this mission for advanced ship tracking and Very High Frequency (VHF) data exchange. The NORSAT-2 satellite carries a next generation Automatic Identification System (AIS) receiver from Kongsberg Seatex, along with a VHF data exchange (VDE) payload that enables two-way communication at higher data rates than possible with AIS [1]. The author’s contributions to the mission were performing unit tests for the components of all the spacecraft subsystems as well as designing and assembling the flatsat from flight spares.

Gedex’s Vector Gravimeter for Asteroids (VEGA) is a highly sensitive accelerometer designed to be carried by a microspacecraft and deployed on asteroids or small moons. This instrument has an associated instrument on-board computer board (IOBC), which acts as an interface between it and the spacecraft computer. This computer board was developed by the Space Flight Laboratory (SFL) for Gedex. The author’s contributions to this payload were modifying the instrument computer board schematic, laying out the parts as a printed circuit board, developing and applying test software, and performing thermal acceptance testing of two instrument computer boards.

The Space Flight Laboratory has developed a cylindrical Hall effect thruster for microspacecraft. This thruster combines the cylindrical configuration for a Hall thruster and uses permanent magnets to achieve miniaturization and low power consumption, respectively. With a suitable power supply, this thruster can be available for use on microspacecraft missions. The author’s contributions to this potential payload were to design, build, and test a power processing unit. This engineering model is not expected to be suitable for flight, but it is an important step towards a flight model and raises the technical readiness level.