

# **NPSAT1 Environmental Test**

## ***Introduction***

NPSAT1 is a low-cost, technology demonstration satellite hosting a number of experiments. Commercial, off-the-shelf (COTS)-based technology will be implemented with custom designs to offer a low-cost command and data handling (C&DH) subsystem building on commercial, desktop PC architecture and standards-based specifications. In addition to an experimental C&DH subsystem, NPSAT1 will demonstrate the use of non-volatile ferroelectric RAM which is inherently radiation-tolerant and lithium-ion polymer batteries, state-of-the-art technology that will be employed offering high energy density (Watt-hr/kg) for space applications.

Experiments on-board NPSAT1 include two Naval Research Laboratory (NRL) payloads. The coherent electromagnetic radio tomography (CERTO) experiment and a Langmuir probe. The CERTO experiment is a radio beacon which, in concert with ground station receivers, is used to measure total-electron-content (TEC) in the ionosphere. The Langmuir probe will augment CERTO data by providing on-orbit measurements. The other experiments are of NPS origin. These include a novel design for a spacecraft computer board, a COTS visual imager (VISIM), and some micro-electromechanical systems (MEMS)-based rate sensors.

## ***Description of Thesis Topic***

The NPSAT1 spacecraft will undergo a number of environmental tests in order to fly as a secondary payload. Testing will include a low-level modal survey, random vibration in all three axes, and thermal-vacuum cycling. Testing will be performed at the system level as well as the module, or subsystem, level. The officer student will work along with staff engineers to finalize and execute the environmental test plan for both the subsystem and system-level tests. This includes understanding the spacecraft functions to a level where functional tests can be defined as a pass/fail criterion of the environmental test. Launch carrier requirements are to be researched and used to define test levels. The completed thesis will serve as a test report of the various testing performed.

## ***Proposed Outline***

- NPSAT1 Introduction
- Secondary Payloads Requirements
- Overview of Testing Methods and Philosophies
- Launch Carrier Requirements
- NPSAT1 Test Plan
- Description of Testing Performed
- Conclusions & Recommendations
- Appendix of Test Results and Test Data

### *Suggested References*

- General Environmental Verification Specification for STS & ELV Payloads, Subsystems, and Components, GEVS-SE, NASA/GSFC, January 1990.
- Test Requirements for Space Vehicles, MIL-STD-1540B, Oct. 1982.
- Application Guidelines for MIL-STD-1540B, MIL-HDBK-340, July 1985.