GENMAT-1 Satellite Technical Description

The overall goal of the GENMAT-1 mission, is to use the correlated geodetic mineralogical data from its Hyper Spectral Imager (HSI) to locate minerals and potentially other sensible resources of interest (including in-ground, surface persistent, and uptake into living matter). Data will be correlated with ground truth field observations to validate the image processing software.

The satellite will be launched as a secondary payload aboard a SpaceX Falcon 9, from either Vandenberg SFB or Cape Canaveral SFS, no earlier than September 30, 2023. It will be inserted into a circular, sun synchronous orbit at 525 km, with an inclination from the equator of 97.6 degrees. Transmission will begin 1 hour after deploy, and cease at the end of the mission, 2 years later. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs within 14 years after launch. See the Orbital Debris Assessment Report for details.

The spacecraft is a single unit comprised of 6 CubeSat modules (giving an overall dimension of 365 mm x 239.4 mm x 128.5 mm.) The total mass is 8.8 Kg.

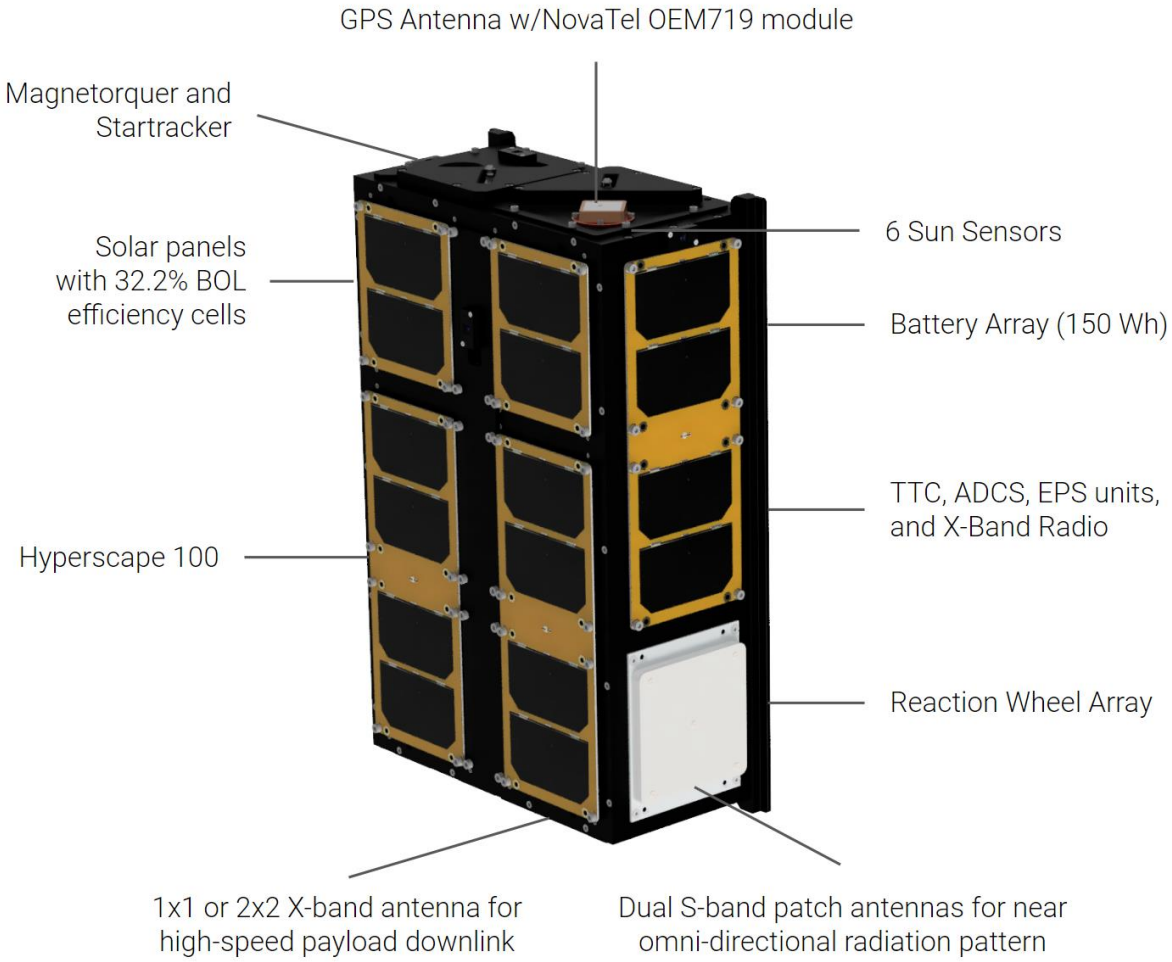

Figure 1 GENMAT-1 Overview

The satellite contains the following systems:

Guidance, Navigation and Control (GNC) Subsystem:

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The GNC Subsystem determines attitude and position with a GomSpace OEM719 GNSS receiver, a star tracker, and sun sensors. Attitude is controlled with 4 reaction wheels and a 3 axis magnetorquer. The GNC is controlled by a dedicated ADCS computer.

Command and Data Handling (CDH) Subsystem:

The two critical printed circuit boards in the CDH subsystem are the Level Zero (L0) and the Flight Computer (FC) boards. The L0 board is the most critical spacecraft control hardware, and operates regardless of flight computer operating state. The L0 includes all communications interfaces to the transceiver and the FC and performs basic spacecraft state of health maintenance.

Communications Subsystem (COMMS):

The COMMS includes GomSpace AX2150 S band transceiver for telemetry, command and control; Endurosat X band transmitter for payload data downlinking; and patch antennas. Ground stations are provided by third party Leaf Space. In conformance with § 5.107 Transmitter control requirements, all transmission from the satellite can be terminated by uplink on the S band.

Electrical Power Subsystem (EPS): The EPS is a direct energy transfer system using a solar array producing approximately 13W of orbit average power to charge the 150 Whr battery system. The batteries are COTS Panasonic 18650 type cells. The L0 board sends signals to the Power Switch Boards to control charging and load switching.

Thermal Control Subsystem (TCS): The design is such that natural conduction and radiation will maintain the subsystem temperatures within acceptable ranges.

Structure Subsystem: All primary structural systems are constructed from 7075-T6 grade aluminum which has been hard anodized.

Propulsion Subsystem: No propulsion subsystem is included.

Payload Subsystem: Payload A - Hyperspectral Imager (HSI). The HSI will capture hyperspectral data over a wavelength range of 470 nm to 870 nm.