TAGSAT-1 Technical Description

The overall goal of the TAGSAT-1 mission, is to test and monitor performance for the NearSpace Launch, Incorporated (NSL) Black Box Tag. The Tag returns data on position and velocity, gathered via GPS receiver, to NSL via the Globalstar system. It is self powered and operates independently of the larger Sherpa spacecraft to which it is attached.

The Sherpa, owned by Spaceflight Inc., and attached Tag will be launched on SpaceX SXRS-3, NET December 1, 2020, into a near-circular, sun synch orbit at 525 km altitude. Transmission from the Tag will begin 12 hours after the payloads are deployed from the Sherpa, and then the Tag will remain active for 2 years. Atmospheric friction will de orbit the Sherpa and attached Tag, approximately 4 years after launch.

The Tag is a single unit attached to the Sherpa, see Figure 1.

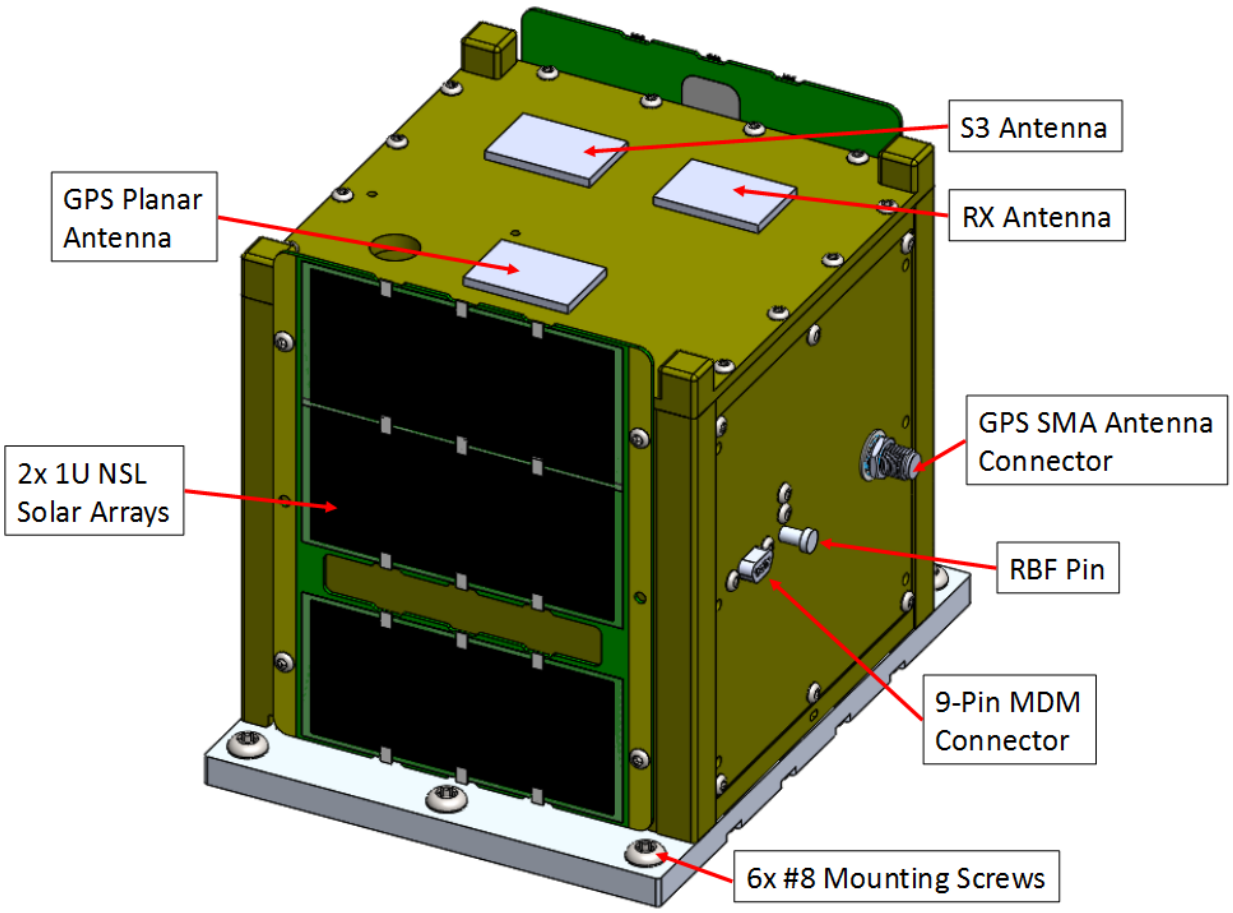

Figure 1 TAGSAT-1 Overview

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The Tag contains the following systems:

Navigation and Attitude Subsystem: Attitude determination is made using a GridEye infrared horizon sensor. A GPS receiver is also included. From the GPS inputs, the CDH determines position and velocity.

Command and Data Handling (CDH) Subsystem: The CDH function shares hardware with the EPS function. The hardware includes dual processors with onboard diagnostics supporting both the EPS and CDH functions. Commands from NSL mission operations, transmitted by the NSL ground station, are received through the receiver module.

Communications System: The transmitter consists of an EyeStar S3 Simplex module manufactured by NSL, using a patch antenna, and transmitting to the Globalstar constellation on the established Globalstar channel 1616.25 MHz. All transmission can be terminated on command from the NSL ground station, transmitting in the range of 2467 MHz. A GridEye Horizon Sensor on the patch antennas, allows transmitting only when the antenna is pointing away from the earth.

Electrical Power Subsystem (EPS): The EPS is a direct energy transfer system using 2 1U NSL solar arrays, producing approximately 1.6 W of orbit average power to charge the 5.6A-hr battery system. The total energy storage capacity is 41.44 W-hrs. The solar arrays utilize standard Alta Devices flexible photovoltaic cells; the batteries are COTS Tenergy 925050 Li-Polymer cells. The Advanced EPS board controls the charging through four MPPT modules and load switching of the system.

Thermal Monitoring Subsystem (TMS): The TMS consists of (4) thermocouples located throughout the electronics boards and on each solar array. There are no active heating mechanisms. The thermocouples are wired to the Advanced EPS board, which hosts algorithms to monitor and record the temperatures, and the EPS can shut down modules based on temperature.

Structure Subsystem: The structure is fabricated of 6061 Aluminum alloy.

Propulsion Subsystem: No propulsion subsystem is included.

Payload Subsystem: The primary payloads are the GPS receiver and the processing software to determine position and velocity.