TROOP-F2 Technical Description

The goal of the TROOP-F2 mission is for the satellite to act as docking target for VIGORIDE RPO Demo Mission 1 ("Vigoride"), which will approach it to 10 meters but not touch it. After the target experiment is completed, it will continue to operate, testing radios and sensors.

TROOP-F2 will be launched on SpaceX Transporter 8, NET June 10, 2023, into a circular sun synch orbit at 525 km altitude. Vigoride will deploy from SpaceX Transporter 8, and the TROOP-F2 will deploy from Vigoride. Transmission from the TROOP-F2 will begin 30 minutes after it is deployed from Vigoride. TROOP-F2 will remain active for 2 years. Atmospheric friction will de orbit the TROOP-F2, within 5 years after launch.

TROOP-F2 is a 4.9 kg 6U cubesat with deployable solar panels, see Figure 1.

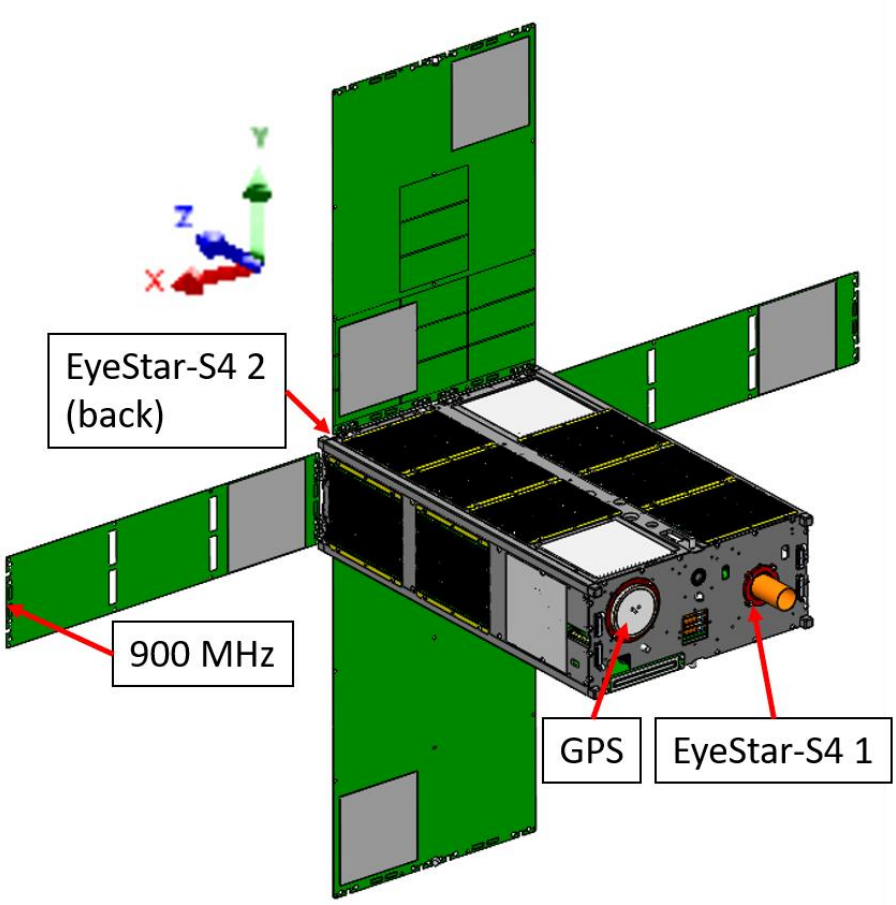

Figure 1 TROOP-F2 Overview Showing Antenna Locations

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TROOP-F2 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, and orbit parameters are derived. Transmitted to Earth, these will provide accurate orbital TLEs, which will support accurate ground station antenna pointing, as well as updating of the SpaceTrack database to allow CSPOC to catalog and maintain the location of the spacecraft.

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:

1) Two EyeStar S4 transceiver modules manufactured by NSL, each using a patch antenna, and communicating with the Iridium constellation on the established Iridium channels. Two are provided, only one is used at any given time. A GridEye Horizon Sensor on the patch antenna, allows transmitting only when the antenna is pointing away from the earth.
2) A transmitter in the 900 MHz band, to communicate location data to the Vigoride spacecraft. The transmitter uses a patch antenna.

All transmissions from the satellite can be suspended, with a command transmitted via the Iridium constellation from mission operations to the satellite.

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. Solar panels extend upon deployment of the cubesat.

Propulsion Subsystem: No propulsion subsystem is included.