Meshbed Satellite Technical Description

The overall goal of the Meshbed mission is to test the FUSE experimental phased array communication antenna.

The satellite will be launched as a secondary payload aboard a Polar Satellite Launch Vehicle (PSLV) operated by the Indian Space Research Organization (ISRO), from Sriharikota, India NET June 1, 2019, and deployed upon the rocket reaching orbit. It will be deployed from the rocket in a 505 km circular orbit, on an inclination from the equator of 97.5 degrees.

UHF transmission will begin no earlier than 30 minutes after deployment, and cease 6 months after that. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs about 3.4 years after launch. See the Orbital Debris Assessment Report for details.

The spacecraft is a single unit with the dimensions of 3 stacked 10 cm X 10 cm X 10 cm CubeSat modules (giving an overall dimension of 10 cm X 10 cm X 30 cm.) The total mass is about 4.5 kg.

Figure 1 Meshbed Stowed Configuration

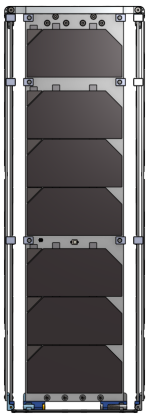
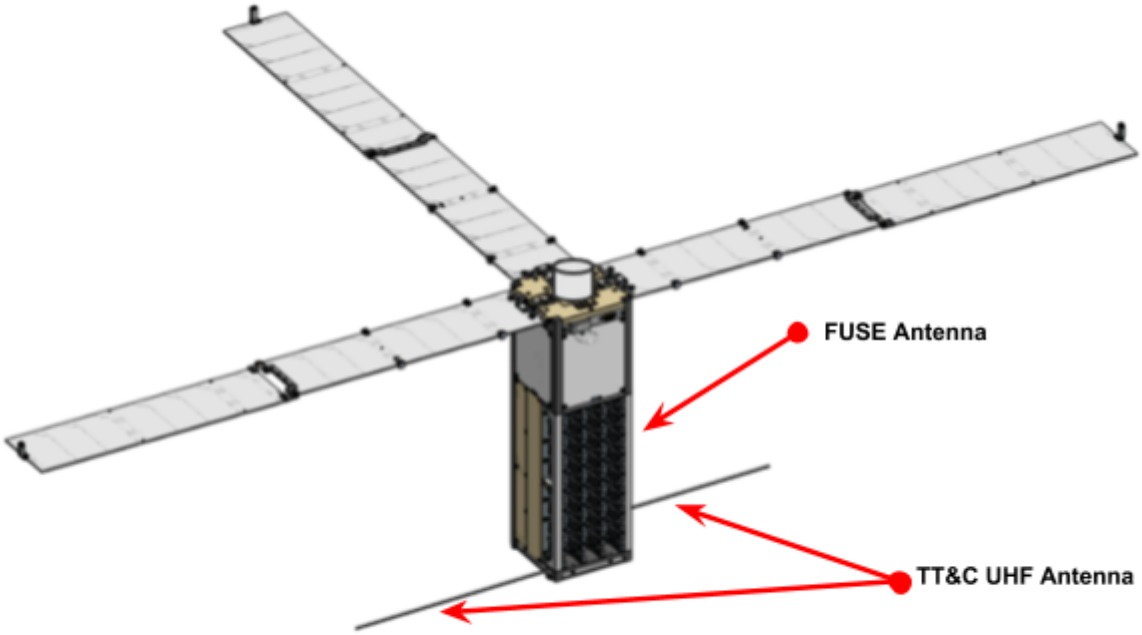


Figure 2 Meshbed Deployed Configuration



The satellite contains the following systems:

Guidance, Navigation and Control Subsystem: Attitude determination and control system includes one reaction wheel, five magnetic torquer panels, a 3-axis magnetometer, a 3-axis inertial measurement unit, a GPS receiver, and six coarse sun sensors. Nominally, the spacecraft will fly with its solar panels in a sun-point configuration.

Command and Data Handling Subsystem: A Flight Computer (FC), consisting of a low-power microcontroller, sensor suite, and communication interfaces will command and control all components of the satellite. The FC receives instructions from the ground station through a dedicated UHF TT&C radio, and issues commands to all other subsystems for operation of the cubesat. Additionally, the FC collects telemetry from all subsystems and forwards that information to the ground station through the TT&C link.

Electrical Power Subsystem: A COTS battery assembly of 8 lithium ion cells will provide 20 watts on average with a peak of approximately 65 watts. The battery

assembly will be charged at time of integration and three deployable solar arrays will recharge the assembly on-orbit. Power management and distribution electronics onboard the spacecraft control the charge of the battery and flow of power to other spacecraft elements.

Communications Subsystem: Commands are received, and data is transmitted, via a GomSpace 100UL UHF transceiver. The ground station is owned and operated by RBC Signals, in Windham, NY.

Also on board is the payload software-defined radio transceiver connected to the experimental phased array antenna.

Thermal Control Subsystem: Analysis and test has shown that the Meshbed satellite will require passive cooling and that the electrical subsystems will generate sufficient heat as to mitigate the need for active heating. Passive cooling consists of thermal strapping of hot components, and thermal shimming of all electrical hardware assemblies to the chassis walls. Portions of the spacecraft chassis are designed to act as thermal radiators. Temperature sensors are integrated into all major subsystems, allowing for thermal monitoring from the ground to inform operational thermal control, such as duty cycling and low-power cooling cycles. The batteries contain a closed-loop thermal control system with integrated resistive heaters that act independently of flight software.

Structure Subsystem: The structure is fabricated mainly of aluminum; minor portions are fabricated of ULTEM amorphous thermoplastic polyetherimide (PEI) resin.

Propulsion Subsystem: No propulsion subsystem is included.

Payload Subsystem: The primary payload is the FUSE experimental phased array communications system, designed and built by MITRE Corporation. The antenna is connected to the GomSpace software-defined radio TR-600 transceiver. The associated ground terminal, operated by MITRE is located in Bedford, Massachusetts.