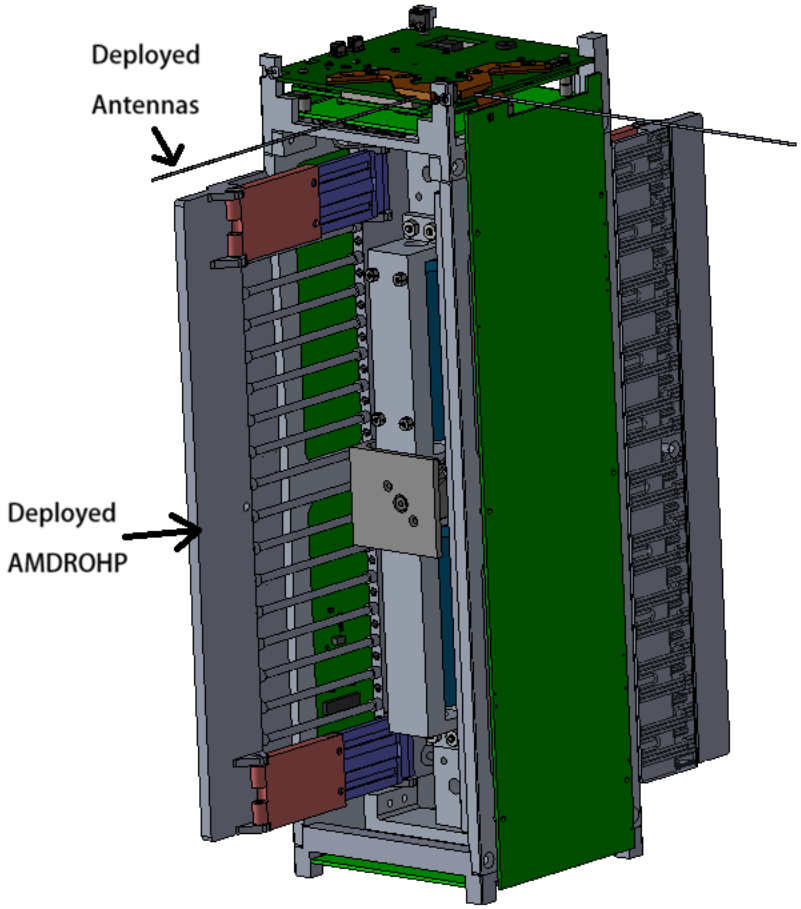
AMDROHP Satellite Technical Description

The AMDROHPSat aims to provide an on-orbit demonstration of an Additively Manufactured Deployable Radiator with Oscillating Heat Pipes (AMDROHP) and raise the technology TRL.

The satellite will be launched as a secondary payload aboard NG-25 from Kennedy Space Center and carried to the ISS in December 2026. It will be deployed from the ISS and inserted into a Low Earth Orbit at 429 km apogee and 414 km perigee, on an inclination from the equator of 51.63 degrees. Transmission will begin 220 minutes after deployment and cease upon end-of-life or as commanded from the ground segment. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs about 1 year after launch. The spacecraft is a 3U with overall dimensions of 30 x 25 x 10 cm deployed. The spacecraft will have a mass of about 4.1 kg. See the Orbital Debris Assessment Report for details.

Figure 1 Overview



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The satellite contains the following systems:

Attitude Determination and Control (ADCS)

AMDROHPSat's ADCS consists of the following:

A passive attitude controller in the form of hysteresis rods and a permanent magnet to dampen the spacecraft's rotational rate in all three principal axes.

An IMU composed of a 3-axis gyroscope and a 3-axis accelerometer to measure the spacecraft's rotation and acceleration rates.

A magnetometer to measure the spacecraft's attitude

An optical camera to verify attitude control through analysis of percentage of the captured image which includes the Earth.

Command and Data Handling (CDH)

The C&DH subsystem consists of an ARM9 processor and provides standard I2C, UART, SPI, USB 2.0 Full Speed, and ISI Interfaces. The C&DH handles commands received from the communication subsystem and allocates each command to its respective service. The C&DH also manages all the data from the spacecraft's on-board sensors by compressing and encoding the data to prepare for transmission.

Communications Subsystem (COMMS)

The Communications Subsystem consists of the spacecraft's L-dipole antenna and amateur frequency UHF radio daughter board. The spacecraft's COMMS transmits health beacons every 9 seconds for the life of the mission and additional payload, ADCS, and system telemetry when requested by the Cal Poly ground station. In conformance with § 5.107 Transmitter control requirements, all transmission from the satellite can be terminated from the ground station by manual command.

Electrical Power Subsystem (EPS)

The Electrical Power System consists of the avionics stack including the Systemboard version 1.5 and several daughter boards, 14 solar cells, and four Samsung INR21700-50S Li-Ion batteries. The purpose of the EPS is to regulate, distribute, store, and generate power for the spacecraft and its payloads.

Structure Subsystem

AMDROHPSat's structure is composed entirely of 6061-T6 aluminum. The structure's main purpose is a chassis to secure and restrain the spacecraft's components during all phases of the mission from launch to disposal. The structure also contains a deployment mechanism in the form of a burn wire to deploy the spacecraft's antenna, and a Hold Down Release Mechanism (HDRM) to regulate the deployment of the radiators.

AMDROHP Payload

AMDORHPSat will fly two AMDROHP payloads (Additively Manufactured Deployable radiator with Oscillating heat Pipes). These radiators will deploy on orbit and conduct thermal dissipation experiments and gather data to downlink to the ground station. These experiments will analyze the radiators' ability to dissipate heat in Low Earth Orbit (LEO).

Camera Payload

AMDROHPSat will fly an optical camera as a secondary payload to capture images for verification of the CubeSat ADCS and for education and outreach efforts. The camera is an Omnivision OV3642 camera with 3 megapixels (2048x1536). Images are stored on an onboard SD card and downlinked to the ground segment as commanded by ground operators.