HiakaSat Satellite Technical Description

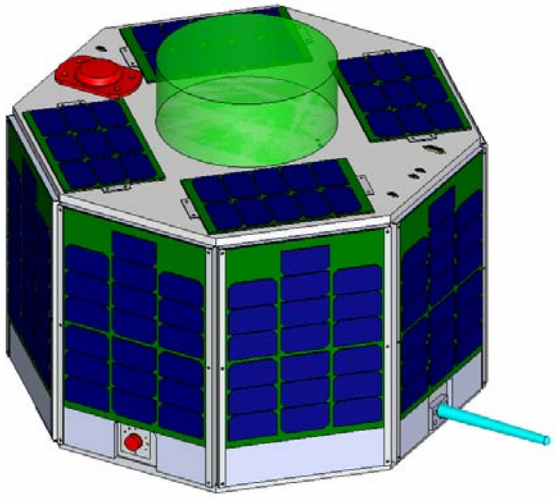
Attachment to SpaceCap Application

The HawaiiSat-1 mission's 'HiakaSat' satellite is the University of Hawaii's first microsatellite class satellite. The overall goal is to develop and demonstrate an experimental COTS satellite bus which will be carrying an experimental hyperspectral imaging system.

The satellite will be launched in late 2013 (current estimate is November 2013) as the primary payload aboard the ORS-4 launch vehicle from the Pacific Missile Range Facility on Kauai, Hawaii, USA. The estimated orbit is 430 x 505 km with an inclination of 91-93 degrees. Transmissions will begin immediately after first contact on orbit, and cease upon de-orbiting or when licensing cannot be renewed (current estimate is 2 years maximum). Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs approximately 5.46 years after launch. See the Orbital Debris Assessment Report for details.

The satellite uses a typical microsatellite octagonal shape with body mounted solar panels. The satellite is roughly 24x24x16.9 inches, and its mass is approximately 55kg.

Figure 1 HiakaSat Overview



The satellite itself is being built completely with commercial or industrial grade commercial off the shelf components. Operation of the satellite in space will demonstrate whether the components will be viable for use on future flight missions. The satellite contains the following systems:

EPS – Electrical Power Subsystem: Generates, stores, and distributes electrical power. Power generation is done via solar panels, and storage is done with LiFePO4 batteries. Also provides safing for the satellite with integrated deployment detection.

Telecom – Provides control of the satellite via UHF(435-438MHz) and VHF(146-148MHz) uplinks utilizing 9600bps FSK. The subsystem also provides downlink capability via UHF(435-438MHz) and VHF(146-148MHz) using 9600bps GFSK, and S-Band (2422 +/- 3.5MHz) which utilizes 1.5Msps OQPSK.

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ISC – Integrated Spacecraft Controller: Low level flight computer which handles basic power management, monitors uplink channels for reset or radio silence requests, and monitors higher level subsystems for fault conditions and automatic resets. Built as a higher reliability part with multiple watchdog timers and self power-cycling capability.

OBCS – On-Board Computer Subsystem: Handles mission execution, housekeeping data collection, payload operation, payload data storage, and attitude control.

ADCS – Attitude Determination and Control System: Gathers information from GPS, 3-axis magnetometer, 3-axis gyro, 3-axis accelerometer, and star tracker to determine attitude. Utilizes three magnetic torque rods to control attitude, and one reaction wheel to handle singularities in magnetic control. This provides 3-axis stabilization, nominally within +/- 5 degrees.

TCS – Thermal Control Subsystem: Passively and actively regulates temperature of the satellite bus and payloads.

Structures and Mechanisms – Packages satellite into structure suitable for flight. Provides deployment mechanism for a quarter wave VHF antenna.

HIP – HSFL Imager Payload: Color 5MP camera with narrow field of view lens for imaging the Earth with an approximate 100m resolution.

SIP – Separation Imager Payload: Color 5MP camera with wide angle lens for imaging the launch vehicle upon initial deployment and power-up.

SUCHI – Space Ultra Comapct Hyperspectral Imager: Hyperspectral imaging camera with an approximate 300m resolution. The experimental thermal hyper-spectral remote sensing payload is called the ‘Space Ultra-Compact Hyperspectral Imager’ (SUCHI). SUCHI is being developed by the Hawaii Institute of Geophysics and Planetology (HIGP) at the University of Hawaii. The key difference that SUCHI has from other similar remote sensing technologies is its ability to operate without cryogenic cooling.