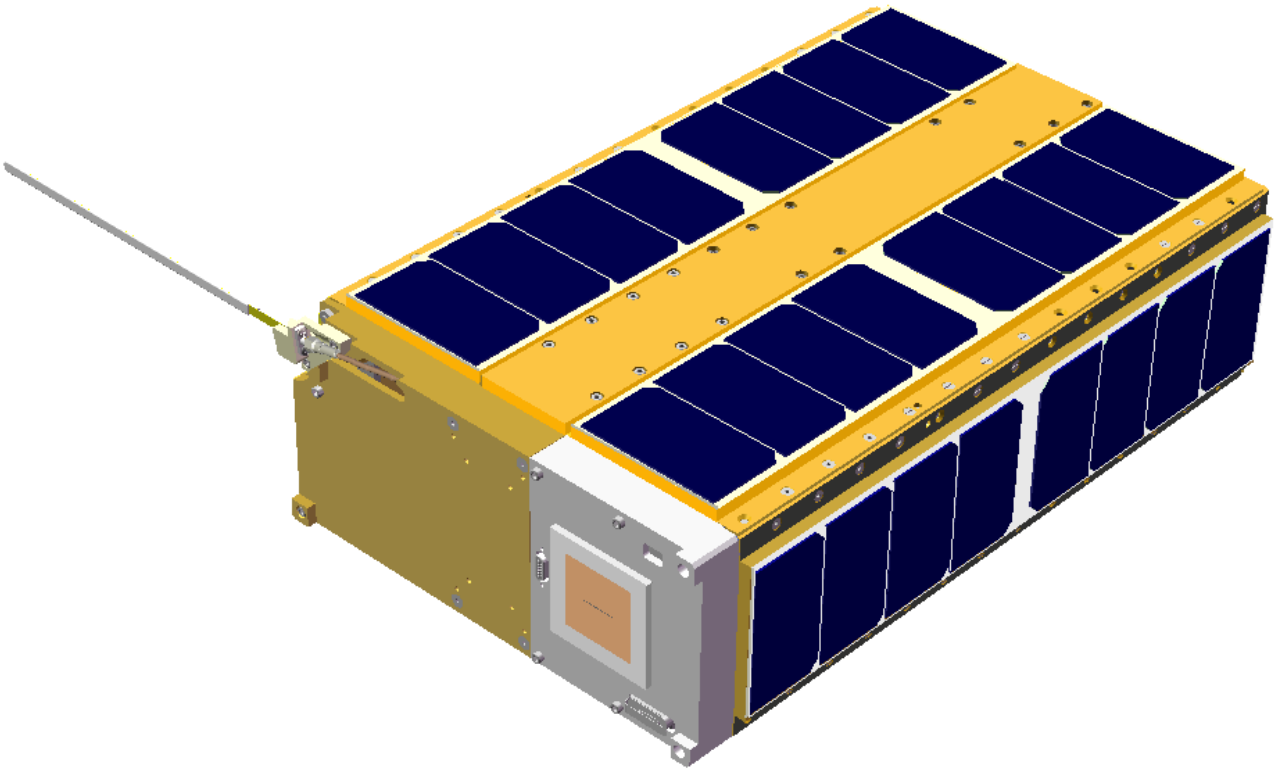
EcAMSat Technical Description

The overall goal of the EcAMSat mission, is to investigate how and whether space microgravity affects the antibiotic resistance of *E. coli*, a bacterial pathogen responsible for urinary tract infection in humans and animals. Bacterial antibiotic resistance may pose a danger to astronauts in microgravity, where the immune response is weakened. Scientists believe that the results of this experiment could help design effective countermeasures to protect astronauts' health during long-duration human space missions.

EcAMSat will be deployed from the SHERPA™ space tug, which is launched as a secondary payload on SpaceX Falcon 9. Launch will be done during the period from December 1, 2015 to February 1, 2016. It will be inserted into an orbit at 720 km apogee and 450 km perigee, on an inclination from the equator of 98.27 degrees. EcAMSat will spend about a month after launch completing the experiment and relaying data to the ground. Transmission will begin within one hour after deployment in orbit, and cease at the end of an extended mission period. The extended mission period will likely be multiple years, possibly until deorbiting. This period is used for training university students in satellite mission operations. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs approximately 17 years after launch. See the Orbital Debris Assessment Report for details.

The dimensions of the spacecraft are consistent with 6U nano-satellite and ISIS QuadPack™ Model 2XL CubeSat-derived form factor. The spacecraft is a single unit with overall dimension of 9.9 cm X 22.6 cm X 36.6 cm.) The total mass is about 13.6 Kg.

Figure 1 EcAMSat Overview



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The satellite contains the following systems:

Power System: Obtains, stores and distributes power using solar cells, batteries and controls. There are 6 solar panels with 8 solar cells each. The cells are 4cm x 7cm UTJ cells with an efficiency of 28.3%. The power storage batteries consist of 2 double packs of Li-Ion cells with a nominal voltage of 7.4V, and 4000 mAH capacity. Power Consuming Sections include the Power Distribution System, Command and Data Handling (CD&H) System, Communications Systems, Payload Electronics System, Optical System and Fluidics System.

Battery PCB: The battery protection circuit PCB features a hysteresis capability that is used to prevent the batteries from discharging completely. If the battery voltage reaches the preset lower limit the protection circuit shuts the entire satellite down except the battery charge control function. Then the satellite will not be allowed to draw any power until the batteries are fully charged.

Command and Data Handling System (C&DH): Processes commands received from the ground and controls spacecraft systems functions and flow of data from spacecraft data storage systems to the and from Communications Systems. To prevent the C&DH from getting stuck in an endless loop a watchdog timer is employed.

Communications Systems: Consists of a UHF Amateur Transmitter Beacon, MicroHard™ 2.4 GHz transceiver, and associated antennas. The telecommands for all spacecraft functions are received via the 2.4Ghz system.

Attitude Determination System: Monitors and records current from solar panels. This data is transmitted to the ground and analyzed to determine rate of rotation. (Attitude control is passive, incorporating magnetic rods and hysteresis rods (for rate dampening).)

Payload Electronics System: Monitors and controls payload experiment, specifically Optical System and Fluidics System. Records experiment data and payload health and status information.

Optical System: Excites and observes optical wells in experiment, and transmits optical intensity data to Payload Electronics System for storage.

Fluidics System and Biology Experiment Card. Provides an optically transparent growth containment for EcAMSat's biology experiment, and provides fluid storage and controls flows of fluids to experiment optical wells.