

TechEdSat Description

The overall goal of the Technical Education Satellite (TechEdSat) is to employ a small spacecraft to evaluate, demonstrate, and validate two new technologies for future experiments aboard small space satellites and other small payload systems. Both technologies were initially developed with NASA's Innovative Partnerships Programs (IPPs).

The first technology is the AAC's Plug-and-Play power architecture, the goal of which is rapid configuration of nanosatellite avionics components. The second technology is use of two communications satellite constellations, Iridium and Orbcomm, for two way communication with mission operations on Earth.

To evaluate these technologies, San Jose State University students will develop, build, test, and flight qualify a CubeSat for deployment from the International Space Station. Qualification and development of the CubeSat will be overseen by assigned NASA Ames Research Center mentors from the Office of the Chief Technologist.

The satellite will be launched from International Space Station (ISS) on August 26th, 2012. It will be inserted into an orbit at 413.2 km apogee and 381.3 km perigee, on an inclination from the equator of 51.6° degrees. Amateur band beacon transmission will begin forty minutes after launch from ISS. The experiment will complete and all communications will be shut down 10 days after launch from ISS. The downward and retrograde release vector will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs 105 days after launch. The spacecraft is a single CubeSat unit 10 cm X 10 cm X 10 cm. The total mass is about 1.33 kg.

Spacecraft Systems:

Power: One Canon 930-BP battery, four photovoltaic panels, and four temperature sensors to monitor the temperature of the battery, solar panels and circuit boards inside the spacecraft.

Control and Data Handling (C&DH): Four miniaturized Remote Terminal Unit (nanoRTU) devices to interface with comm. devices, one RTU "lite" device, and one Main Power Distribution Unit (MPDU) "lite" with a watchdog timer.

Communications: One ORBCOMM Q1000-CPM modem with 45 cm antenna, One Iridium 9602 modem with patch antenna, and one StenSat amateur beacon with 12 cm antenna.

Antenna Deployment System: The deployment of the antenna is controlled using a nylon retaining cord, which holds the antennas in place. In their stowed position, the antennas wrap around the body of the satellite. When antenna deployment occurs, the pyro circuit activates a heating element which melts the nylon wire, releasing both antennas at once.

Attitude Control: Four rod magnets will stabilize the satellite and bring it to the desired attitude (beacon antenna down, Orbcomm antenna up).

Attitude Determination: None

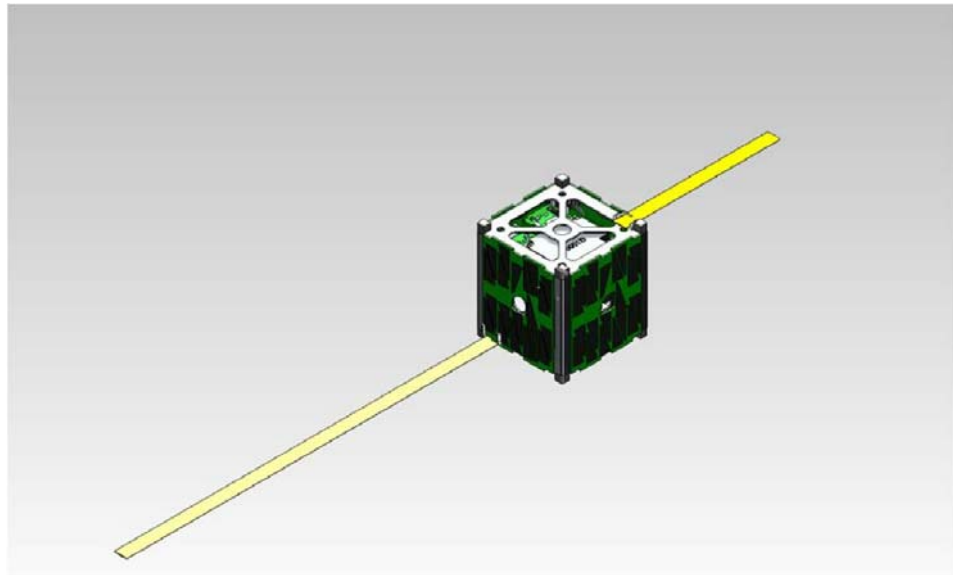


Figure 1: TechEdSat Module Overview

TechEdSat will be deployed from the International Space Station (ISS) by the JEM Remote Manipulator System (JEMRMS) by the Japan Aerospace Exploration Agency (JAXA). It will be the first satellite to be soft-stowed in the ISS and later integrated in the JEMRMS. This system will launch TechEdSat at a velocity of 5 cm/sec and at an angle of 45 degrees relative to the ISS, down and retrograde. The figure below shows the deployment process and unobstructed jettison cone. The mass to drag ratio of the TechEdSat will cause the spacecraft to lose altitude relatively rapidly, and de-orbit 105 days after launch.

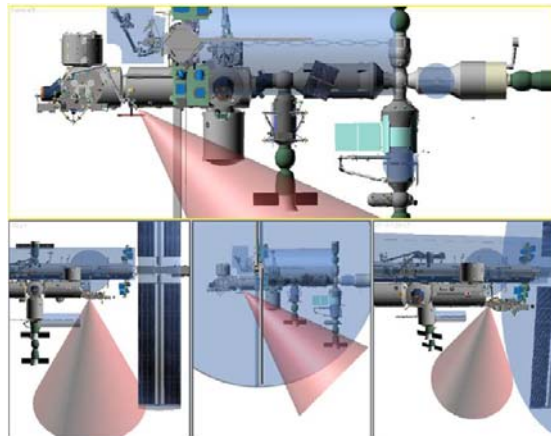


Figure 2 Deployment Vector and Clearance Cone
(ISS direction of travel right to left)