Millennium Space Systems ALTAIR Satellite Technical Description

Attachment to SpaceCap Application

The overall goal of the Millennium Space Systems ALTAIR Pathfinder spacecraft is on orbit demonstration, risk reduction, test and characterization of key avionics and components for the Millennium ALTAIR spacecraft prototype. The key hardware functions of the ALTAIR core will be demonstrated and flown in their objective design configurations.

The satellite will be transported to the International Space Station (ISS) aboard Orbital ATK OA-7 mission, launched by an Atlas 5 from Cape Canaveral Air Force Station, Florida on March 16, 2017. It will be deployed from the ISS about 30 – 60 days after launch, estimated April 17, inserted into an orbit at 416 km apogee and 409 km perigee, on an inclination from the equator of 51.65 degrees. Transmission will begin about 30 minutes from deployment, and transmission will continue for a maximum of 6 months. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs about 1.2 years after deployment. See the Orbital Debris Assessment Report for details.

The spacecraft follows the CubeSat general format, the stowed dimensions are 10 cm X 10 cm X 68 cm. The total mass is about 14 Kg.

The satellite contains the following systems:

Guidance, Navigation and Control (GNC) Subsystem: The GNC is a pitch momentum bias system using one reaction wheel for momentum, and torque coils built into the structure to cancel environmental torques. The equipment complement of torque coils, triaxis magnetometer, dual Inertial Measurement Units (IMU), and reaction wheel are the critical components in this subsystem. Additional hardware being flown but not required for flight control include a GPS receiver, and a star tracker.

Command and Data Handling (CDH) Subsystem: The two critical printed circuit boards in the CDH subsystem are the Level Zero (L0) and the Flight Computer (FC) boards. The L0 board is the most critical spacecraft control hardware, and operates regardless of flight computer operating state. The L0 includes all communications interfaces to the transceiver and the FC and performs basic spacecraft state of health maintenance.

Electrical Power Subsystem (EPS): The EPS is a direct energy transfer system using a solar array producing approximately 16W of orbit average power to charge the 6.4 A-hr battery system. The solar arrays utilize standard SolAero photovoltaic cells; the batteries are COTS Panasonic 18650B cells. The L0 board sends signals to the Power Switch Boards to control charging and load switching.

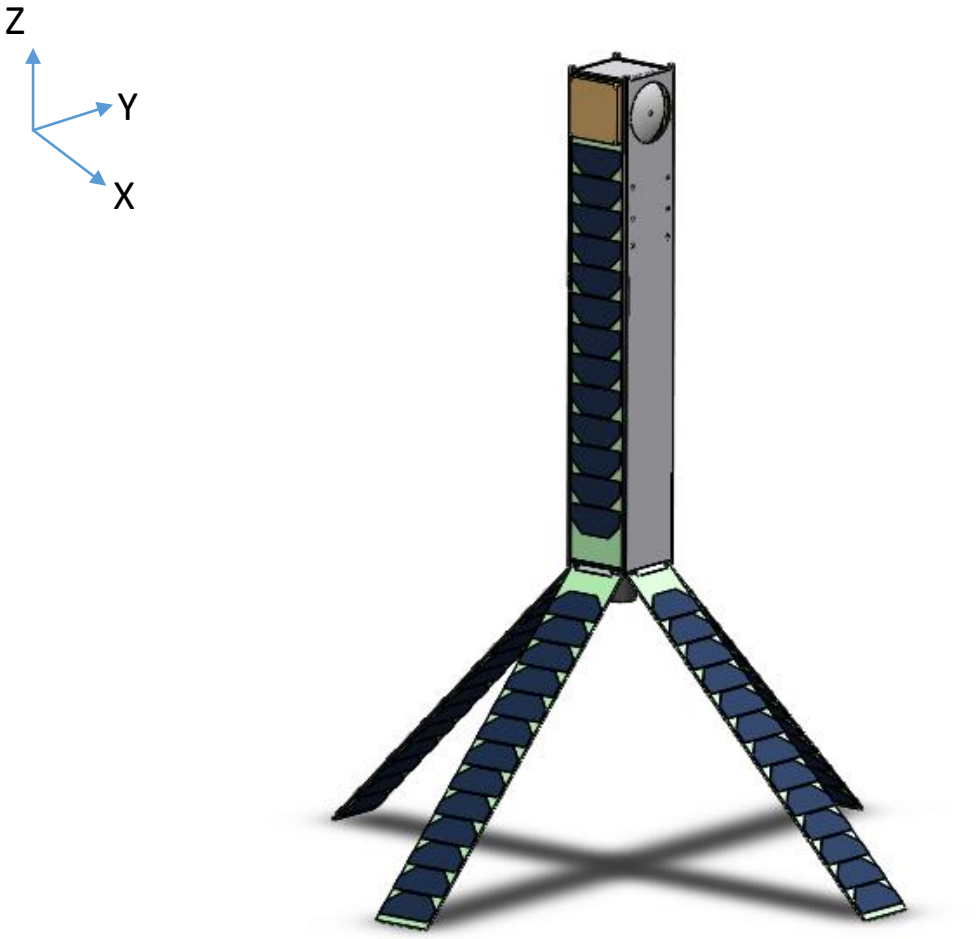
Thermal Control Subsystem (TCS): The TCS controls hardware temperature through cold biasing of the thermal design, utilizing heaters to stabilize temperatures. Sensors are wired to the L0 board, which hosts thermal control algorithms to control the heaters.

Structure Subsystem: The structure is largely fabricated of additively manufactured thermoplastic polymer composite material. The composite structure provides all primary load paths to the Aluminum guide rails that attach to the Nanoracks launcher.

Propulsion Subsystem: No propulsion subsystem is included in the ALTAIR Pathfinder mission.

Payload Subsystem: The heritage Payload Interface Card (PIC) offers data storage and data processing capabilities which will be tested during flight.

Figure 1 ALTAIR Satellite Overview



The Patch Antennas are located adjacent to +Z end of the spacecraft, on the +Y Face and the –Y Face. The brown square in the figure above, represents the -Y antenna. The star tracker is on the –Z face. Four deployable solar arrays, with cells on both sides, are shown attached to the –Z edges. In flight the attitude is controlled so that the direction of travel is +Z.