

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 product line. 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 Antares-CRS-5, launched from Wallops Island, Virginia, June 24, 2016. It will be deployed from the ISS around July 1, 2016, 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 cease by about December 31, 2016, and in any case, will cease within 6 months of the beginning of transmission. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs about 9 months after deployment. See the Orbital Debris Assessment Report for details.

The dimensions of the spacecraft are consistent with CubeSat standards. It is a 1 x 6 unit configuration, with the dimensions of 10 cm X 10 cm X 60 cm. The total mass is about 16 (TBR) 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 interfaces with the radio and mission control and the most critical spacecraft hardware, regardless of flight computer operating states. The L0 includes all communications interfaces to the transceiver and the FC.

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 1x6 U structure is largely fabricated of additively manufactured PEKK thermoplastic polymer composite material. The PEKK structure and the aluminum closeout plate provide the 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.

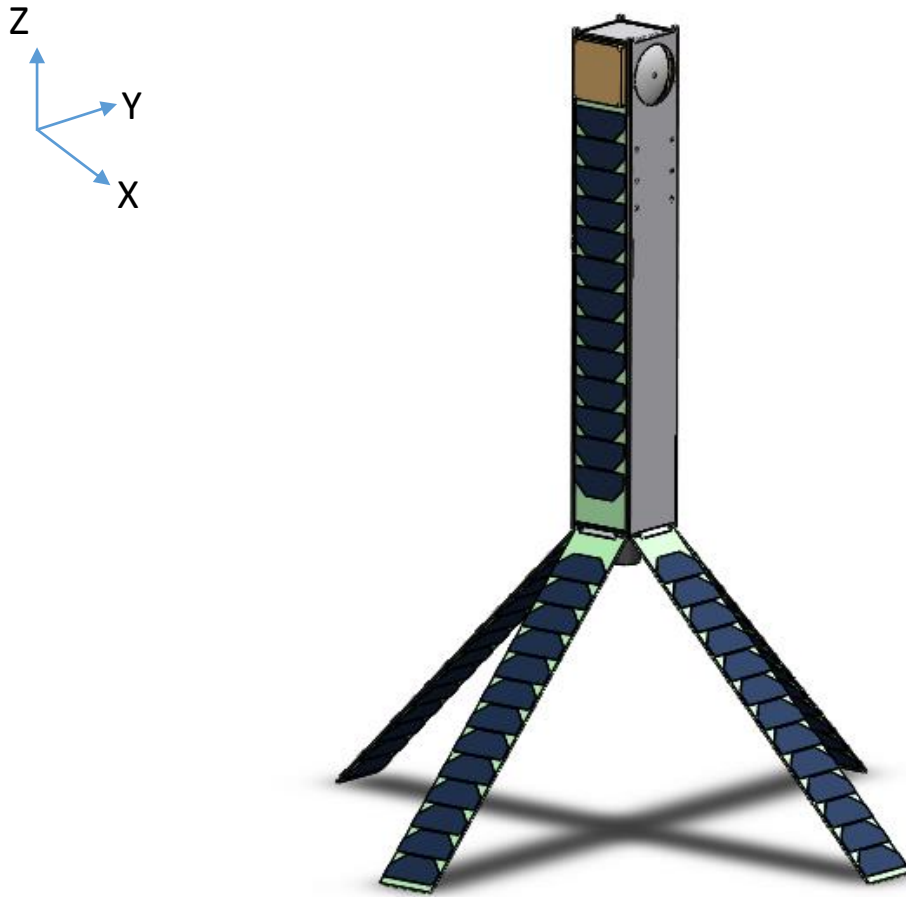
Payload Subsystem: The payload consists of a Payload Interface Card (PIC) with a daughterboard hosting a developmental transceiver chip. The heritage PIC offers data storage and data processing

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capabilities. The Pathfinder mission unique modification has the PIC hosting a transceiver chip terminated to a load to establish interface capabilities for future Millennium RF products.

Figure 1 ALTAIR Satellite Overview



The transceiver patch Antennas are located adjacent to +Z end of the spacecraft, on the +Y Face and the -Y Face. On the +X face is the GPSR patch antenna. The star tracker is at the opposite end, with boresight pointing out from the -Z face.