AeroCube-8 FCC Mission Statement

The AeroCube-8 (AC8) mission consists of two free-flying AeroCube-8 satellites that will operate as test beds for five new nanotechnology payloads. These payloads include advanced solar cells, carbon nanotube (CNT) wire harnessing, a CNT-filled material, a CNT-laminate radiation shielding material, and an electric propulsion system. This on-orbit technology demonstration will assess the readiness of these payloads and increase their TRL so that they may be used on larger spacecraft.

The AeroCube-8 satellites are NANOSAT class satellites, each weighing less than 2.2 KG and measuring 4x4x6 inches. They will be launched on an Atlas V vehicle, slated for May, 2014. The orbit is 390 km x 700 km with 60 degree inclination. DAS 2.0.2 predicts a lifetime of 6.75 years (area-to-mass ratio of 0.0103 m2/kg) and a spacecraft probability of collision with space objects larger than 10 cm in diameter during the orbital lifetime of the spacecraft of 0.00006, well below the 0.001 threshold required (see "**AC8_DAS202_Output_v1**" Exhibit). DAS 2.0.2 analysis predicts the risk of human casualty for the expected year of uncontrolled reentry and the orbital inclination of less than 1/10000, which also meets the requirement.

Each of the two AeroCube-8 satellites have one radio. The AdvRadio is built by The Aerospace Corporation around a Texas Instruments CC1101 transceiver chip. It operates at a fixed 914.7 MHz frequency (see "**AdvRadio bandwidth**" Exhibit) and outputs 1.2 Watts. The radio attaches to an omnidirectional patch antenna on the AeroCube-8 with a 0 dBi gain.

When the AeroCube-8 satellites are ejected, they will power on. However the radio will be in receive mode only. As each satellite flies over a ground station, the station will continuously beacon towards the satellite. When the satellite radio hears the beacon, along with the proper serial number code, it will respond and a link will be established. At that point, the ground station will ask the satellite for information, typically payload data or onboard telemetry. The satellite will respond by downlinking the requested information. When the link is lost due to the satellite passing out of view and the satellite was transmitting, the satellite will try up to 3 seconds to complete the last packet transmitted. The satellite will then revert to a passive receive mode and wait for the next beacon from a ground station.

We would like to use two types of ground stations to communicate with the AeroCube-8 satellites. The first is a 5-meter diameter dish antenna at The Aerospace Corporation in El Segundo, CA. At 914.7 MHz, it has 30 dB gain, 5 deg beamwidth and uses an AdvRadio with a 9W amplifier. The second ground station is a portable 2-meter diameter dish. This has 22 dB gain, a 10 deg beamwidth and uses an AdvRadio with a 9W amplifier. This portable station would be located in an RF quiet area that improves the ground footprint of the ground station network. A typical satellite pass is 8 minutes long, twice per day - so the system spends a lot of time not in use. The antenna parameters and ground station locations are shown in the exhibit "**FAA sketch and antenna figures v2**."