AeroCube-8 FCC Mission Statement

The AeroCube-8 satellites have been developed by The Aerospace Corporation (Aerospace) for our purpose of conducting experiments in space per our charter as a private, non-profit corporation operating a Federally Funded Research and Development Center in support of the US Air Force (contract number FA8802-14-C-0001).

The AeroCube-8 is a Nano class satellite, weighs approximately 2.0 kg and is 4x4x6 inches in dimension. It will be launched on an Atlas V vehicle, slated for September 2016. The orbit is 550 km x 580 km with 98 degree inclination. DAS 2.0.2 predicts a lifetime of 15.3 years (area-to-mass ratio of 0.011 m^2/kg) and a spacecraft probability of collision with space objects larger than 10 cm in diameter during the orbital lifetime of the spacecraft of 0.000001, well below the 0.001 threshold required (see "**AC8 C&D DAS2.02 Output**" 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.

The AeroCube-8 experiments specifically include 1) measurements of the performance of carbon nanotube materials as structures, insulators, conductors, and radiation shielding materials in the space environment; 2) performance and lifetime characterization of an ion-electrospray propulsion system; 3) performance and lifetime characterization of next-generation solar cells in a space environment; 4) performance and lifetime characterization of a novel space thermal blanket. All payload components were either developed by Aerospace or supplied to Aerospace as "Government Furnished Equipment" for the purpose of conducting in-space experiments.

Each of the two AeroCube-8 satellites has two cameras with fields of view of 17 degrees and 70 degrees and ground sample distances of greater than 100 m. The cameras were designed by Aerospace with each using a MT9D131 CMOS digital image sensor supplied by ON Semiconductor. The primary purpose of the cameras is for verification of attitude control performance. The waiver we have received from NOAA specifies that we are not required obtain a NOAA license, nor even to notify NOAA regarding the use of cameras on satellites flown in support of our research for the United States Government, which applies in this case.

Each of the two AeroCube-8 satellites has 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 1.3 W. 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 the 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 a complementary radio with a 9W amplifier. The second ground station is a portable 2-meter diameter dish. This has 22 dB gain, a 15 deg beamwidth and uses a complementary radio 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**."

This license is being requested under 47 CFR Part 5.3 (c) for "experiments under contractual agreement with the United States Government." The experimental radio service as requested is defined under 47 CFR Part 5.5 as "for purposes of providing essential communications for research projects that could not be conducted without the benefit of such communications." Aerospace will be the sole operator of the satellites and all experiments on board. Aerospace is not providing a service for fee to host payloads.