AeroCube-16 FCC Mission Statement

AeroCube-16 (AC16) program is a technology demonstration in Low Earth Orbit, consisting of a pair of 6U CubeSats. The vehicles will demonstrate a space cryptographic unit, a variety of nanotechnology payloads, and test the performance of advanced solar cells. Technical data from AeroCube-16, including results from these experiments, will be used to validate ground test data and inform future research.

The AeroCube-16 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). All payload components were developed by Aerospace for our purpose of conducting in-space technology demonstration experiments.

The AeroCube-16 satellites are Nano class satellites, each of which weighs approximately 9.4 kg ith outer dimensions of 36.6 cm x 22.6 cm x 11 cm. Deployable solar panels extend off the long axis of the spacecraft with dimensions 36 cm x 10 cm. AeroCube-16 is manifested as part of the upcoming Rocket Lab RASR-5 mission from Wallops Flight Facility in Virginia. The mission orbit will be circular at 525 km altitude and will be inclined about 50.0°. DAS 3.1.2 predicts an orbital lifetime of less than 7 years (area-to-mass ratio of ~0.0085 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 less than 0.000001, well below the 0.001 threshold required (see "**AC16 DAS3.1.2 Output**" Exhibit). DAS 3.1.2 analysis predicts the risk of human casualty for the expected year of uncontrolled reentry and the orbital inclination to be zero risk, which also meets the requirement.

Each of the two AeroCube-16 satellites has star trackers and other attitude control verification imagers. The cameras were designed by The Aerospace Corporation. The primary purpose of the cameras are for attitude control determination and verification. 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 our capacity as a private, non-profit FFRDC, which applies in this case.

The AeroCube-16 satellites each have two radios for redundancy. Only one radio is transmitting at a time.

1. 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-16 body with a 0 dBi gain
2. The Innoflight SDR is Sband with 2225 MHz for downlink and 2075 MHz for uplink with a 1.6 MHz of necessary bandwidth (see "**Innoflight SDR bandwidth**" exhibit). The radio attaches to a patch antenna on the AeroCube-16 body with a 7.1 dBi peak gain and 70 degrees full-width, half maximum beamwidth.

The ground segment for the 914.7 MHz radios is the Aerospace Ground Network (AGN). Each AGN terminal is a portable 2-meter diameter dish with 22 dB gain, a 12 deg beamwidth and uses a complementary radio with a 9W amplifier. The AGN is distributed geographically and located in RF quiet areas. The ground station locations are listed in the "**FAA sketch and antenna figures**." The ground segment for the Sband radio will be provided by Kongsberg Satellite Services with ground stations in countries other than

the United States. For all ground stations, a typical satellite pass is 8 minutes long, twice per day - so the system spends a lot of time not in use.

When the AeroCube-16 satellites are ejected, they will immediately power-on into their SAFE mode. The ADVradio will periodically be powered-on in receive mode only. As each satellite flies over an AGN earth station, the earth 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 AGN 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. The Innoflight SDR S-band contacts with the Kongsberg Satellite Services ground stations will be scheduled and therefore will not be turned on unless a pass is planned.

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.