This request for an STA is necessary to support aviation safety-related research sponsored and administered by the National Aeronautics and Space Administration (NASA) Glenn Research Center (GRC). Mosaic ATM is the prime contractor for the research project, a two-year Small Business Innovation Research (SBIR) effort (NASA contract number 80NSSC21C0465). Mosaic ATM is pursuing an STA for the limited use of a Bluetooth radio beacon which, in its high-power mode, would violate FCC Part 15.247(e). Use of the beacon in the high-power mode would be extremely limited in continuous operation (under an hour for up to four times a day) and time frame (only for seven business days total) and take place in remote areas.

The research is investigating a concept of how a Bluetooth radio beacon, when affixed to a small Unmanned Aircraft System (sUAS), can improve aviation safety by informing General Aviation (GA) pilots of sUAS 3D locations in real-time. Note that for this STA no airborne operations will take place. All beacon testing will be performed on the ground as a proof of concept.

In the concept under investigation, the Bluetooth radio broadcast includes sUAS 3D position and speed information, such as latitude, longitude, altitude, heading, and groundspeed. A computer tablet (e.g., iPad), collocated in the cockpit with the GA pilot and capable of receiving the Bluetooth signal, can then display to the pilot the sUAS location so that the pilot may avoid it. Figure 1 (available upon request) shares the cockpit display of traffic information (CDTI) that would be presented to the pilot on the tablet in the concept. In the figure, the display suggests to the pilot to turn right to avoid an oncoming aircraft. Yellow and red bands indicate velocities, headings, and altitudes which should be avoided by the pilot. Longer broadcast ranges provide better forewarning and lead-time for the GA pilot.

In support of the research, Mosaic ATM has designed and produced a prototype Bluetooth radio beacon which follows the Federal Aviation Administration Remote ID Rule: https://www.faa.gov/uas/getting_started/remote_id/. This rule is now implemented as Title 14 Part 89 under the Code of Federal Regulations. This rule mandates the broadcast of sUAS position information for certain types of sUAS operations via Bluetooth or Wi-Fi.

Mosaic ATM's research prototype is capable of two different transmission power levels. One standard-power level that conforms with FCC Part 15, transmitting at 13 dBm. And a second, high-power level, that transmits at 20 dBm. The high-power level would violate FCC Part 15.247(e) where the power spectral density exceeds 8 dBm within a 3 kHZ band during continuous transmission. The research team notes that 20 dBM is within the legal range of broadcast power and therefore anticipates that negative impacts to any nearby devices would be extremely minimal.

The rationale behind the second, experimental high-power level is to extend the realized broadcast range closer to the ideal range which was defined in previous research conducted by Mosaic ATM. In this previous research, Mosaic ATM defined a 3.0 nautical mile range as the ideal broadcast range for improving aviation safety for general aviation pilots with respect to encounters with sUAS. The research team, by way of a statistical RF link budget model, believes the standard power level - 13 dBm - is capable of approximately a 0.9 nautical mile range. And the high-power level -20 dBm - capable of around a 2.8 nautical mile range. The STA would allow the research team to explore and define the

effective range of the 20 dBm broadcast, providing NASA and the FAA important information regarding the potential performance envelope.

The use of the high-powered broadcast would be carefully limited, in duration and geographic location, and be constrained to three locations. In all locations, use of the standard- and high-powered broadcast would be terrestrial (i.e., on the ground) only.

The first location is the Wake Forest, North Carolina area at two sites: 1) a local park, and 2) in the parking lot area of the Wireless Research Corporation of North Carolina. {E. Carroll Joyner Park in Wake Forest, NC (701 Harris Rd, Wake Forest, NC 27587) and the Wireless Research Center of North Carolina (3331 Heritage Trade Drive, Suite 101, Wake Forest, NC 27587}.

The second location is the Pawnee National Grassland in remote northeastern Colorado on the Colorado Eastern Plains, an especially depopulated area of the Great Plains.

The third location is just north of Ephraim, UT, a small city in rural Utah, approximately 60 miles south of Provo, UT. Ephraim has a population of 7,000. Testing would take place four miles north of Ephraim in a rural and agricultural area.

Note: The research team anticipates having to submit a subsequent STA application to support additional test locations. A subsequent STA is required because the testing would take place more than six months after this initial STA. Mosaic ATM mentions this detail in a full faith effort to disclose the entire testing plan with the FCC. The additional location is Virginia Tech's Mid-Atlantic Aviation Partnership (MAAP) Kentland Experimental Aerial Systems Laboratory, an FAA-designated drone test site in remote southwestern Virginia. Unlike the locations cited above, for this subsequent STA, testing at Virginia Tech's location would include airborne testing, carefully designed and orchestrated by the MAAP flight test engineering team. MAAP has proven experience conducting flight tests and a robust safety risk management program to mitigate risks.