# 14 CFR 107.51 Question 1.

1. **Question: Describe how the small, unmanned aircraft (sUA) will be able to avoid nonparticipating aircraft and structures when operating at altitudes other than those prescribed in Title 14, Code of Federal Regulations (14 CFR) § 107.51(b).**
2. **How will the Remote Pilot in Command (RPIC) and Visual Observer(s) (VO), if used, see, and avoid other aircraft when flying over 400 feet above ground level (AGL)?**

 The RPIC (I) will be able to avoid non-participating aircraft and structures when operating at 1,500 feet AGL, using a combination of several methods. First, operations will be strictly confined. Geofencing will be present to avoid any trees, power lines and other structures in my flight area and limit the altitude to no higher than 1,450 AGL, allowing a 50-feet buffer for altitude and measuring errors. The horizontal limit will be set to no more than 65-feet lateral distance from the ground control station. To ensure that the operation doesn’t affect any manned aircraft we will operate at zero conflict. All of our flights are before sunrise or during civil twilight. If the RPIC identify any aircraft, they will immediately terminate the flight with a descent to below treetop height. All the sUA operation flights will be completed just before sunrise. This is a low air traffic time and the nearest ATC, KISM is not open until 7am.

We are operating before sunrise and in a low traffic area at that time of day. Should an aircraft approach the visual flight area we are operating at zero conflict and will terminate the flight immediately with a descent. Before any of our sUA operations we will actively check the FAA site for any TFRs or NOTAMS. We will also monitor flight radar via flightradar24. This will be used to monitor any IFR aircraft that are within a 15-mile radius that is inflight with a heading into our flight area. We are operating at zero conflict so if there are any aircraft identified entering our monitored flight area, we will terminate the flight. We will continuously monitor the airspace for any VFR aircraft within 5 miles with a heading towards our operating area. If an aircraft is identified the sUA flight will be terminated based on our zero-conflict operation.

We conduct a preflight brief about the communication to be used so there is no confusion during the planned flight. The landing zone would be preplanned, and since we have a small working area 65’ it would be the same as our takeoff zone.

 The sUA used in this operation are small and will have 4 anti-collision lights. These lights have been specifically designed to comply with all anti-collision lighting drone requirements. The anti-collision lights are rated for three statute miles. To ensure that the RPIC will be able to visually see the SUA we have conducted tests within the limitations of our current waivers for night operations with a 400-foot ceiling. During these tests we have attached all four Anti-Collision lights to the sUA and flew up to 390 feet high and 1,500 feet, 2,000 feet, 2,500 feet, and 3,000 feet away. These flights were completed before and during civil twilight. During the test at each distance the RPIC was able to continuously visually monitor the sUA position and direction.

upon request we can provide screenshots from video taken during our test flight as well as drone flight map to confirm the distance. This waiver is requesting an altitude of 1500 feet with a 65’ horizontal geofence during and before civil twilight. With the safety measures of additional lighting and software limitations (Geofence) we will be able to safely complete our operation and maintain visibility of the sUA for the entirety of the flight.

The anti-collision lighting has been rated by the manufacturer to be seen for at least 3 statute miles. All the flights will be completed before sunrise. and with a dark clear sky background. The anti-collision lighting will be easily monitored up to the requested 1450 feet altitude and 65 feet away per the Geofence.

The Anti-Collision lights will be located at the following places on the sUA:

* The front right leg (4 LED Green)
* The front left leg (4 LED Red)
* The top (4 LED White)
* The bottom (4 LED White)

We are operating at zero conflict, in the event an aircraft enters the flight area that is an imminent threat of collision, the RPIC will maintain altitude and make an assessment as to whether it is best to maintain the altitude or make a quick descent. In no case should the sUA be descended when the non-participating aircraft is lower than the sUA. Making a turn to avoid collision would be the preferred yielding method. We will use monitoring equipment at the ground control station and visual techniques to ensure that the RPIC continuously knows the location and altitude of the sUA. The Geofence will also be set and will verbally alert the RPIC of flight limitation are reached.

# 14 CFR 107.51 Question 2

**Describe how the visual conspicuity of the sUA will be increased to be seen at a distance of at least 3 statute miles (mi).**

* **Will the sUA be visible for at least 3 mi in the location where the RPIC will operate?**
	+ **If yes, how will you accomplish this?**
	+ **If no, why do other aircraft not need to be able to see your sUA from at least 3 mi?**

 The factory provided lighting on the sUA does not provide sufficient lighting to allow the RPIC and Visual Observer (VO) to maintain positional awareness of the aircraft at night. To overcome this limitation, all the flights will be conducted before sunrise and the aircraft has been equipped with high visibility position and anti-collision lighting. These are ultra-bright LED position lights that can be seen by the RPIC for 3 statute miles.

The Anti-Collision lights will be located at the following places on the sUA:

* The front right leg (4 LED Green)
* The front left leg (4 LED Red)
* The top (4 LED White)
* The bottom (4 LED White)

We will also monitor VFR aircraft in the sUA operating area. The following criteria must be met for this sUA operation to occur.

VFR requirements:

* 1,000 feet above
* 2,000 feet horizontal
* 500 below
* Visibility of greater than 6 miles
* Cloud base of greater the 3000’

 All of the flights are operated before sunrise with a dark sky and maximum altitude of 1,500’ and a horizontal distance not to exceed 65 horizontal feet. We will operate at zero conflict. If the RPIC will identify any aircraft, we will immediately terminate the flight.

 In the event of a partial or complete lighting system failure, the aircraft’s forward progress will be halted, and the aircraft placed in a hover. The RPIC will immediately notify the flight crew to terminate the mission and then return the aircraft to the closest designated landing area. The ground control station is equipped with a display that the RPIC will use to determine the aircraft's location, orientation, altitude, and airspeed. Since the aircraft's horizontal geofence has been implemented the sUA can be lowered to a visual height and landed safely

# 14 CFR 107.51Question 3

**Describe how the RPIC will be able to accurately determine the sUA altitude, attitude, and direction of flight.**

**How will the RPIC be able to tell which direction the sUA is pointing or flying in the dark?**

**While keeping eyes on the sUA, how will the RPIC continuously know the current real-time**

* **(1) geographic location,**
* **(2) altitude above ground level,**
* **(3) attitude (orientation, deck angle, pitch, bank) and movement of the sUA?**

The RPIC will use a dedicated remote and ground control station to maintain continued readings from the sUA. This will allow the RPIC to accurately determine sUA altitude, attitude. The sUA Anti-Collision light consist of 4 lights placed on all sides of the sUA listed above. The flight path will consist of flying the sUA vertically to gather wind data within a short 65’ horizontal deviation. The intended flight is to fly the drone straight up and straight down and the horizontal movement will be minimal if any.

All flights will operate during or before civil twilight with a dark clear sky background listed in this waive. The anti-collision lights are rated for three statue miles. To ensure that the RPIC will be able to visually see the sUA we have conducted tests within the limitations of our current waivers for night operations with a 400-foot ceiling. During these tests we have attached all four Anti-Collision lights to the sUA and flew up to 390 feet at 1500 feet, 2,000’, 2,500, 3,000. These flights were completed before and during civil twilight with a dark clear sky background. During each test at each distance the RPIC was able to continuously visually monitor the sUA position and direction. This waiver is requesting an altitude of only 1500’ with a 65’ horizontal geofence during and before civil twilight. With the safety measures of additional lighting and software limitations (geofence), we will be able to safely complete our operation and maintain control of the sUA for the entirety of the flight. The aircraft's direction of travel is straight up and straight down from the launch site. The aircraft's orientation can be determined visually using the 4x Anti-Collision lights and the relative motion of the aircraft. If the aircraft moves right, the aircraft was pointing toward the observer and is now pointing right. The light position above will allow the RPIC to identify the direction of the sUA. The sUA camera and ground control station will indicate the direction of travel. Since the flight is straight up and straight down the direction of the sUA would only be used to avoid obstacles if any were present at the balloon launch site.

 To increase the safety of the flight and provide increased situational awareness, the ground control station for the sUA provides real-time telemetry on aircraft battery level, geographic location (with map overlay), horizontal distance from the launch point, horizontal distance between the sUA and the RPIC, altitude (AGL), attitude, horizontal speed across the ground and direction of flight. The ground control station S/N number 1t2cgbur0759sm and it provides all this data real time. The display presents the data using a combination of voice alerts and a visual display. The location of the display allows the RPIC to quickly obtain the needed real-time data while maintaining visual awareness of the aircraft's position. For our low light missions, the ground control station display is set to minimum brightness and does not impact the RPIC eyes' adjustment to the dark. Critical warnings such as low battery, maximum altitudes and maximum distance are always established for each mission and are presented by the ground control station with voice alerts.

# 14 CFR 107.51Question 4

**Describe the area of operations using latitude/longitude, street address, identifiable landmarks, or other maps to include the distance from and direction to the nearest airport, (e.g., 16 miles W of KISM Airport).**

 The sUA will be used to calculate wind speed and direction. The planned flying area is at xxxxxxxxxxxxxxxx, FL 33837 28.xxxxxxxx,-81.xxxxxxx

or alternative ¾ of miles north at xxxxxxxxxxxx, FL 33896 28.xxxxxxx, -81.xxxxxxxx. Both sites will be limited to a 65’ horizontal geofence for the entire flight operation. The nearest airport KISM Airport is located 11 miles east of the indented sUA flight area. All the sUA flights are completed before sunrise in a low traffic area; the KISM ATC facility doesn’t open until 7:00am. The balloon operation will comply with FAA regulation Part 91 Rules. The UA will follow part 107 along with the waivers requested above to perform flights. All flight operations will be in class G/E airspace along with the geofencing requirements listed above. Each flight will be straight up and back down from the launch site with little to no horizontal movement. There will not be any flights within A,B,C,D, air space. Should any aircraft approach the visual flight area, we are operating at zero conflict and will terminate the flight immediately. Since we are operating at a low air traffic time of day and the nearest ATC facility not open till after sunrise, we will continue to operate with zero conflict actions.

# 14 CFR 107.51Question 5

**Describe how the RPIC will be able to be contacted by Air Traffic Control (ATC) in case the operation needs to be terminated, as well as a procedure to notify ATC when the operation begins and ends.**

 A cellular phone contact is XXX-XXX-XXX. The flight areas below both have full coverage with 5 bars of service. The location of the requested operations is
YOUR FLYING ADDRESS, FL 33837 28.xxxxxxxx,-81.xxxxxx

or alterative ¾ of miles north at

YOUR FLYING ADDRESS, FL 33896 28.xxxxxxx, -81.xxxxxxx

The RPIC will review flight restrictions for each flight as well as contact weather services to obtain current weather condition for the sUA operation. In the event of an aircraft in the vicinity of the flight we are operating at zero conflict and will terminate the flight immediately.