

LBDP Risk Mitigation Plan (FAA submission)

Operational and Mitigation Details:

General: sUAS operations will be for the purpose of ensuring public safety as it's ultimate end goal. The aircraft will be used as an observation platform to detect nefarious actors or objects associated with criminal activity and document crime scenes. In all instances, the sUAS will only be used where the subject of the mission poses a greater risk to public safety than the risk posed by the operation of the sUAS. Since threats to public safety occur at all hours and areas in the state of California, operations during the hours of darkness are required along with the ability to perform in the state of California.

Risk Mitigation Plans: Operations will occur in the portions of the city of Long Beach that are in uncontrolled [REDACTED] airspace. All flights will remain below 400 FT AGL. The controlled airspace associated with [REDACTED], may be within 5 miles of the intended flying area. The risk to other aircraft will be mitigated by using at least one visual observer (VO) for the operation both day and night. The risk will additionally be mitigated by the use of high intensity strobe lighting visible from a minimum of 3 statute miles to alert other aircraft of the sUAV's presence. While there should be no conflict with manned aircraft below 400 ft AGL, the Remote Pilot in Command (RPIC) and Visual Observer (VO) will visually monitor the area for other traffic, monitor an aviation radio set to the Los Angeles Basin Traffic frequency for low flying aircraft (VHF 123.02 north of the 91 Fwy and 122.85 south of the 91 Fwy), and use AirMap to identify air traffic in the area. Operations will cease and the sUAS will land if there is a potential conflict with other traffic.

While the area in question is congested, ALL operations will be contained within a perimeter secured by law enforcement personnel, preventing the non-participating public from entering the area, as well as ensuring anyone inside the perimeter remain inside structures or buildings.

Small UAS Details and Flight Termination in Emergency Mitigation: All aircraft used for the operation are multi-rotor quadcopters manufactured by DJI. The DJI product line has a reliable performance record. Models used will include the Matrice 100, Phantom 4 Pro, and Mavic Pro. All aircraft models are powered by lithium polymer (LiPo) batteries that yield flight times of 40 min, 30 min, and 21 min respectively. Correspondingly, maximum speeds are 49 mph, 45 mph, and 40 mph. The aircraft vary in weight, ranging from under 14 lbs to just over 1 lbs. All of the airframes have a range that is in excess of 1.2 miles.

All airframes use the DJI 4 Go/DJI GO application to interface the radio controller. The application has a geo-fencing capability that will be engaged during operations to restrict the lateral boundaries of the operation to less than 400 yards and limit the altitude to 200 feet. The radio controller has an immediate flight termination switch (RTH + LT stick down) to abort flight in the event of an impending collision.

Pilot/Personnel Details:

Before a pilot is authorized to conduct a flight during the hours of darkness, under the waiver, he must have completed an operator's course that includes at least 8 hours of flight instruction, four hours of safety instruction (including risk management) and successfully passed a practical flight maneuvers test, as well as, complete a 16-hour course on night operations with 6 hours of actual night flying experience. The practical flight maneuvers test will also be accomplished during the hours of darkness. All personnel must have conducted a sUAS check flight within the preceding 90 days to function as the RPIC.

A minimum of two personnel are needed for operations during the hours of darkness. A visual observer (VO) is required, along with the Remote PIC. The visual observer must be qualified as a RPIC but he does not need to be current (he does not need to have passed a check flight within the last 90 days).

The Responsible Person (Program Manager) will maintain all training records in an aviator training folder. He will also generate a list of available RPICs, based on successful completion of the 90-day check flight date. All training records will be available for inspection upon request. Instruction on the limitations and restrictions of all applicable waivers are incorporated into the 90-day check flight.

Mitigation and sUAS Orientation, Control and Visibility: As previously stated, all operations will occur within 400 yards of the RPIC. From this distance, the RPIC will be able to see the sUAS under most conditions where ambient urban illumination is present. To further assist the RPIC in visually acquiring the aircraft in darkness, the aircraft will be equipped with a strobe light capable of being seen from 3 miles (far in excess of the less than ¼ mile operational distance). Each aircraft comes equipped with position lights on each arm of the quadcopter that assist with visual acquisition of the aircraft.

The position lights will aid the RPIC in determining the direction the aircraft is pointing. The DJI 4 Go/DJI GO Application interface provides two other methods for the pilot to determine aircraft orientation. On the application screen, an arrow indicating the aircraft's orientation on a map inlay is located on the bottom right corner (and can toggle to the primary screen), along with a directional scope on the bottom left portion of the screen. The scope provides orientation information of the aircraft as it relates to the cardinal heading North and the orientation of the controller. By cross referencing this display, the Remote PIC continuously knows their aircraft's current real-time **(1) geographic location**, **(2) altitude** above the ground, **(3) attitude** (orientation, deck angle, pitch, bank), and **(4) direction of flight**.

In the event the RPIC and/or VO lose sight of the aircraft in the dark, the RPIC will: 1) Hover in place while RPIC and VO(s) relocate until VLOS is regained, and 2) Increasing UAS lighting intensity, if able.

The operation will augment the remote pilot with a VO to assist with identifying any other aircraft in the area. Additionally, the local air to air aviation frequency will be monitored for situational awareness of aircraft in the area. As an additional tool, the AirMap application will be monitored for traffic alerts. Any sUAS flight will land if other aircraft are in the vicinity of the operation. The non-participating public will not have access to the operational site. First responder personnel will be located in a designated containment area.

A daylight site survey of the area will be conducted prior to operations beginning. Structures and obstacles will be annotated on a hazard map. When a site survey must be conducted during hours of darkness, ambient lighting must be sufficient to identify all hazards in the area. If ambient lighting is not sufficient to determine hazards to flight, manned public safety helicopters may illuminate the area with a Spectrolab NightSun, with a minimum of 15-20 million candlepower, so the site survey may be completed. Remotely piloted aircraft will not be used if building or obstacles in the area cannot be seen from 800 yards in night VMC conditions (twice the operating distance).

Before operations begin, all participants will receive instruction on recognizing and overcoming visual illusions caused by darkness and be able to understand physiological conditions which may degrade night vision. The instruction will be provided by a current and qualified Certified Flight Instructor or a current, qualified and licensed sUAS pilot Program Manager. Each participant will pass a quiz prior to demonstrate knowledge about night operation risks, such as overcoming night visual illusions, limitations to night vision, and conditions that can affect night vision before engaging in flight activities. The quiz will be corrected to 100% and retained in the RPIC's training folder. The test must be successfully completed annually, by the anniversary date of the original test. A pilot may not act as RPIC without a test with a passing score within the time frame.

Justification that establishes that the operation can safely be conducted under the terms of a certificate of authorization.

All previously mentioned mitigations will ensure the operation can be safely conducted under the terms of a certificate of waiver. At the beginning of each mission, a risk assessment will be conducted for the operation in question. All forms will be archived and available upon request. At the completion of each mission, the sUAS safety committee will review all operations for compliance. The sUAS program and safety protocols fall within the purview of the longstanding LBPD Field Support Division/Special Weapons And Tactics (SWAT).

ALL missions will be performed following the safety guidelines and mitigation.

Mitigation of unforeseen events:

In the event people enter into the operational area (which will be marked out by bright yellow crime scene tape and uniformed police officers on the perimeter) by either disobeying the law enforcement secured perimeter or exiting non-involved structures or buildings, the RPIC will be notified via two-way radio or in person by the visual observer (VO) of such occurrence.

Further, all those involved in the operation will be equipped with two way radios and will be instructed to notify the VO or the RPIC of any non-related persons entering into the operational area and their location. The RPIC will avoid that particular location until the uninvolved party is cleared from the area.