

CITY OF PHOENIX
PARKS AND RECREATION DEPARTMENT
STANDARD OPERATING PROCEDURES
SMALL UNMANNED AERIAL SYSTEMS (sUAS)
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PURPOSE

The purpose of this procedure is to provide members of the Phoenix Parks and Recreation Department (PRD) a set of operational guidelines intended to promote the safe, efficient, and lawful operation of small Unmanned Aerial Systems (sUAS). This document identifies the responsibilities, requirements, and operations of PRD's sUAS program.

PRD's primary intention for integrating UAS technology into its Desert Parks and Mountain Preserves ("Preserves") preservation deployment model is to increase the awareness and efficiencies by which PRD is able to respond to developing negative impacts to the Preserves that PRD manages by providing a unique aerial perspective that assists in PRD's understanding the challenges of a given impact to the Preserves. The ability to utilize aerial imagery over time will provide critical information necessary to guide decision-making. Ultimately, those decisions impact the long term health and well being of the Preserve eco system, cultural resources and recreational amenities.

POLICY

It shall be the policy of the Phoenix Parks and Recreation Department to use UAS to enhance the Department's mission of protecting the City's Desert Parks and Mountain Preserves. Any use of UAS will be in strict accordance with constitutional and privacy rights, FAA regulations and PRD policy.

DEFINITIONS AND ABBREVIATIONS

Above Ground Level (AGL): AGL is the altitude expressed in the actual number of feet measured above the ground.

Air Traffic Control (ATC): Manages traffic from the airport to a radius of 3 to 30 miles. Provide pilots taxiing and take off instructions, air traffic clearance, and advice based on their own observations and experience. Maintains separation between landing and departing aircraft, transfers control of aircraft to the enroute center controllers when the aircraft leave their airspace and receives control of aircraft on flights coming into their airspace.

Beyond Visual Line of Site (BVLOS): the operation of UAVs (unmanned aerial vehicles) at distances outside the normal visible range of the pilot.

Certificate of Authorization (COA): Issued by the FAA and grants permission to fly within specific boundaries and parameters.

Federal Aviation Administration (FAA): Federal agency in the United States and part of the Department of Transportation. The FAA regulates U.S. civil aviation, U.S. commercial space transportation, operates control towers, builds, installs, and maintains electronic aids to navigation, and registers all pilots and aircrafts in the United States.

National Airspace System (NAS): The NAS is made up of a network of air navigation facilities, ATC facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system.

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Navigable Airspace: FAA controlled airspace classified as: A, B, C, D, E, and G.

Notice to Airmen (NOTAM): A NOTAM is time critical information concerning the establishment, condition, or change in any component in the National Air Space (NAS). The NOTAM provides knowledge that is essential to personnel concerned with flight operations in designated areas. NOTAMs may be filed as a temporary change to the NAS as they were not known in advance to publish on aeronautical charts or other operational publications.

Personal Identifying Information: Includes a person's date of birth, social security number, personal telephone number, home address, personal email address, and official state or government-issued driver's license or identification number.

Pilot-in-Command (PIC): Person who has final authority and responsibility for the operation and safety of flight, has been designated as the PIC before or during the flight, and holds the appropriate category, class and type rating, if applicable, for the conduct of the flight. The PIC is solely responsible for the input of commands/piloting during flight operations. Pilots are authorized to evaluate and accept or decline any mission or portion thereof due to safety concerns.

Remote Pilot-in-Command (RPIC): A person who holds a remote pilot certificate with an sUAS rating and has the final authority and responsibility for the operation and safety of a sUAS operation conducted under part 107.

Unmanned Aerial Vehicle (UAV): A powered, aerial vehicle that uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, and can be expendable or recoverable. Refers more specifically to the unmanned aerial vehicle itself.

Unmanned Aerial System (UAS): Consists of an unmanned aircraft weighing less than 55 lbs., the command system, a secure control link, camera, and other related safety support equipment, including ground control base stations and specialty vehicles designed to support unmanned flight operations.

Unmanned Aerial System Crewmember: A Pilot in Command, Visual Observer, or other person's assigned UAS duties for the purpose of flight.

Visual Line of Sight (VLOS): Visual contact between PIC or VO and a UAS sufficient to maintain safe operational control of the aircraft, known location, and be able to scan the airspace in which it is operating to see and avoid other aircraft or objects aloft or on the ground.

Visual Observer (VO): The Visual Observer is equally responsible for the visual observation of the UAS while in-flight. The VO shall alert the PIC of any conditions (obstructions, terrain, structures, air traffic, weather, etc.) that may affect the safety of flight.

*** For the purposes of this SOP and for ease of understanding, small unmanned aircraft, unmanned aircraft, and sUAS are all collectively referred to as UAS. ***

SCOPE

The purpose of this Operational Guideline is to provide the process and procedures for the operations and management of any small Unmanned Aircraft System (UAS) used by PRD. It will detail the conditions
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under which PRD will utilize UAS technology to maximize efficiency and cost savings while minimize risk to PRD staff, the Preserves, and the community.

UAS program development is focused on preservation and protection of the resources found within the Preserves. Emphasis is placed on (a) trail maintenance and hiker safety efforts, (b) cultural resource protection, (c) invasive species mitigation, and (d) trash and debris mitigation efforts.

LEGAL AUTHORITY

The authority to use and operate PRD owned UAS (or “public unmanned aircraft”) from Arizona Revised Statutes, Section 13-3729(D)(2). Further, under Phoenix City Code, Section 24-49(B)(3), PRD is exempt from City regulation of remotely controlled aircraft, unmanned aircraft vehicles, and unmanned aircraft systems. The implementation of any UAS technologies by PRD will comply with all applicable FAA requirements.

UAS REMOTE PILOT CERTIFICATION

PRD and its personnel assigned to UAS operations will adhere to Title 14 of the Code of Federal Regulations, Section 107.12 (14 C.F.R. § 107.12) and will obtain the following certification:

PRD UAS will only be operated by trained, certified and FAA part 107 licensed Members of the Department. These members will successfully complete the following requirements:

- Pass the Unmanned Aircraft General (UAG) – Part 107 Remote Pilot Knowledge Exam
- Be vetted by the Transportation Security Administration (TSA)
- Be issued an FAA Remote Pilot 107 certificate with a small UAS rating authorized to operate UAS platforms of less than 55 lbs.
- Complete PRD UAS Training Program

Initial training and recurrent UAS training will be managed by PRD UAS Program Manager and Coordinator. This training may also be delivered by use of a third party UAS training vendor.

The cost for each UAS Remote Pilot Certification will be funded by the Parks and Recreation Department.

OPERATIONAL GUIDELINES

This procedure is not intended to be all-inclusive, but serve as a supplement to other department guidelines, FAA regulations, and the aircraft manufacturer’s approved user manual.

This procedure has been written to address PRD UAS operations. This procedure will be reviewed and updated annually or any time the FAA issues a new advisory or new regulation. Any changes to the manual will be communicated as currently dictated by PRD policy. A copy of these guidelines and any updates to them will be issued to each person having UAS responsibilities and will be posted on the shared drive so all PRD personnel may access it.

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PRIVACY, CIVIL RIGHTS, and CIVIL LIBERTIES

PRD prohibits the collection, use, retention, or dissemination of UAS collected information in any manner that would:

- a) Violate the United States Constitution and Arizona Constitution. This includes the First Amendment and/or Article 2, § 6 of the Arizona Constitution and the Fourth Amendment and/or Article 8 of the Arizona Constitution.
- b) Discriminate against persons based upon their ethnicity, race, gender, national origin, religion, sexual orientation, or gender identity, in violation of law.

AUTHORIZED DEPARTMENTAL USE of UAS

The primary role of the UAS is in analyzing and assessing the condition of the mountain parks and preserves spread throughout the City by providing aerial imagery and topographic information utilizing high resolution cameras and LIDAR and other sensors as appropriate.

Although not meant to be “all inclusive” or exclusive of any emergent incident type, the following are primary scenarios under which a PRD UAS can be requested, deployed and utilized:

Cultural Resource Protection – Deployment of UAS to routinely inspect known cultural resource areas nondestructively to photograph petroglyphs and archaeological fixtures without having to go off trail to access or draw unwanted attention to sensitive sites.

Trail Project Planning and Observation – Deployment of UAS into Preserve areas to identify trail project issues before a project is to occur, during a project and after. Photography and video generated as part of this effort will be utilized to understand changing conditions to the Preserve trail system.

Capital Improvement Project (CIP) Project Planning and Construction Progress – Deployment of UAS to observe projects sites in the preplanning, design and construction of existing and planned trailheads and other Preserve related projects.

Planned Training Events - The use of UAS during planned training exercises are intended to simulate the safe and proficient incorporation of UAS technology during the above mentioned “real” scenarios.

Non-emergent operations – UAS can be utilized for non-emergent use such as *Invasive Plant Species Identification and Documentation, Trash and Debris Identification and Documentation, Safety, PIO, Preplanning, Inspections, and Training.*

Mountain Rescue - Deployment of UAS into Preserve areas to (1). Verify the existence and location of lost or injured persons who have reached out to Park Rangers for assistance while hiking, climbing, or performing other activities. (2). Provide relevant information to Fire Department technical rescue teams.

PROHIBITED UAS USES

Prohibited uses may include, but are not limited to the following:

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- The Department's UAS will NOT be used to monitor members of the public or provide surveillance for law enforcement purposes.
- The UAS will NOT be lent to any other department or agency.
- Exceeding Aircraft Limitations: The UAS shall not be used in a manner contrary to the manufacturer's guidelines or specifications. To conduct any personal business other than official department business.
- Personal business: The UAS shall not be used to conduct any personal business other than official department business.
- High Risk Missions: UAS will not be flown for any mission during which the Licensed Pilot determines the risk of flying outweighs the benefit to the mission. Risks may include hazards to individuals or property, possible collision hazards with other aircraft, and/or loss of control of the UAS.
- No Fly Zones/"No Drone Zones": FAA rules prohibit UAS from operating in certain flight restricted zones including, without limitation, (a) within a five (5) mile radius of an airport; (b) national parks, monuments, and landmarks; (c) federal military bases; (d) federal prisons; (e) near, or over wildfires; (f) in, and around stadiums one (1) hour before and (1) hour after an event; and (g) nuclear power plants. If PRD determines it is necessary to operate UAS in a No-Fly Zone, FAA or other appropriate authorization will be obtained prior to UAS deployment. *PRD will actively pursue a Certificate of Authorization from the FAA to grant special permission to operate within the various classes of Controlled airspace in the Phoenix Metro Area.*
- Flying After Dark: Per the FAA, UAS are not permitted to fly after sunset or before sunrise unless the UAV is equipped with adequate FAA approved anti-collision strobe lighting, the pilot has the updated 107 certificate and has completed PRD RPIC Level 2 Certification process. Night flights in controlled airspace require FAA approval via LAANC, COA, or Special Government Interest (SGI) approval.
- Height Restrictions: Per the FAA, UAS may not fly more than 400 feet above the ground or higher if the UAV remains within 400 feet of a building or other structure.
- Spraying, Dropping and Hazardous Materials: Use of UAS to spray or carry hazardous materials is prohibited.
- Manned Aircraft in Operating Area: UAS flights are prohibited when other governmental manned aircraft are operating within the defined flight perimeter unless coordinated flight training has occurred with that agency, i.e., Firebird
- Beyond Visual Line of Sight: The UAV must be kept within VLOS. Alternatively, if First Person View or similar technology is used, a visual observer must always keep the UAV within unaided sight (for example, no binoculars). However, the PIC must keep the UAV close enough to be able to see it if something unexpected happens. BVLOS operations may be approved once a

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FAA COA and BVLOS waiver have been attained and the RPIC has been thoroughly trained and approved for these operations by the Program Coordinator.

TRANSPARENCY

To promote transparency about departmental UAS activities within the NAS, PRD, without revealing information that could reasonably be expected to compromise public safety (including law enforcement), shall:

1. Keep the public informed about the Department's UAS Program as well as any changes. To maintain continuous program transparency; as PRD UAS operations and technologies evolve, program improvements will be shared with the public via PRD homepage and/or the department's Public Information Officer.
2. PRD will make available to the public, on an annual basis, a general summary of the department's UAS operations during the previous fiscal year, to include brief descriptions of types or categories of missions flown and, if applicable, the number of times the Department provided UAS support to automatic aid partners. This will be accomplished through the submission of an annual PRD "UAS Activity Report" that will be provided to City Council and available to the public via Public Records Request. PRD law department shall assist as needed concerning individual requests.

PUBLIC RECORDS: Notwithstanding any provisions of this policy regarding confidentiality, or protected rights, all documents related to the Department UAS Program may be subject to disclosure by laws related to open public records. To obtain public records per City ordinance S-36997 JULY 1, 2010: Submit a written request form via fax, e-mail, in person, or by postal mail. Ensure that the incident number, location of the incident, date, and time are provided. The PFD law department shall assist as needed concerning individual requests.

ORGANIZATION ACCOUNTABILITY AND OVERSIGHT

The **Parks and Recreation Department's** UAS program will be managed and administered by the **UAS Program Manager** and his/her staff. The **UAS Program Manager** will report to the Deputy Director of Natural Resources. Duties and responsibilities will include operations, education, training, procurement, device maintenance, and record management.

1. **UAS Program Manager:** The Manager is responsible for the overall direction and performance of the **Parks and Recreation Department's** UAS program and will exercise command and control over both.
 - a) Designated by the Deputy Director.
 - b) Oversees and be responsible for the entire program including budget and reporting.
 - c) Oversees and supervises the Program Coordinator
 - d) Manages the UAS program and ensure that the program operates safely and in accordance with all federal and state regulations.
 - e) Will authorize personnel as Pilots and Visual Observers.
 - f) Maintains files for pilots and observers which include copies of FAA certifications, training records, missions flown, etc.
 - g) Develops and maintain PRD UAS SOP's and maintenance schedule.

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- h) Responsible for investigating reported or suspected of misuse or abuse of UAS technologies using the Notice of Inquiry process.
2. **UAS Program Coordinator:** The Coordinator is responsible for the day-to-day supervision of the UAS program.
- a) Designated by the UAS Program Manager
 - b) Identifies UAS training needs, training options, and opportunities for interagency and third-party collaboration.
 - c) Tracks and reports any training, certification, records, skill, or equipment deficiencies to the Program Manager.
 - d) Completes or designates maintenance tasks.
 - e) Ensures that all UAS personnel maintain an up to date "pilot logbook" and "task book".
 - f) Coordinates with manufacturers, services providers, and other agencies to evaluate future program needs.
 - g) Maintains a working knowledge of current legal and FAA requirements, national operating standards, and a detailed understanding of any sUAS platforms operated by PRD.
 - h) Reviews all UAS Deployment Reports.

UAS Pilot (PIC): The PIC is the sole person responsible for the safety and operation of the UAS during a mission or training.

- UAS operators must be Department personnel and must have at minimum, an FAA part 107 license.
- UAS operators must maintain his/her part 107 license, maintain flight logs and all necessary records to meet the FAA's requirements.
- UAS operators will also be required to open, complete, and maintain a UAS task book detailing operational proficiency through mission specific training.
- Complete the requisite training hours designated by the Program Coordinator.
- The UAS RPIC will be the team leader. The RPIC will ultimately be responsible for the operation and solely responsible for input of commands of the UAS during flight.
- The RPIC will be responsible for UAS assembly, flight preparation, post flight procedures, UAS disassembly/storage procedures and documenting all UAS flights via the UAS deployment report.

UAS Visual Observer (VO): The Visual Observer is crucial in ensuring the UAS operates in a safe manner.

- The UAS Visual Observer (VO) must be PRD personnel and must have at minimum completed the departments Visual Observer course.
- The VO is equally responsible for the visual observation of the UAS while in flight and to alert the PIC of any conditions (obstructions, terrain, structures, air traffic, weather, etc.), which may affect the safety of a flight.
- The VO's added function is to coordinate and communicate operations between the Pilot-in-Command (PIC) and the IC or their designee.

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- The VO will be responsible for all aviation related communications required by Federal Aviation Regulations (FARs). To accomplish this, the observer should be in close proximity and have constant communication, via radio or face-to-face, with the PIC to ensure instant relaying of information.

UAS Teams

PRD UAS Teams consist of a pilot (RPIC) and *ideally* a visual observer (VO). The “team” concept is established to train for and respond to each authorized UAS mission.

Each UAS Team will ideally operate with two (2) members of the Department (pilot-in-command and visual observer). Each member will be assigned a specific role prior to flight. Additional team members may be needed for complex missions.

TRAINING

Instructors:

The Primary instructor(s) will be chosen by the PRD Program Manager. These pilots will be chosen based on UAS experience and operational knowledge within the National Airspace. Through training modules approved by the UAS Program Manager, the UAS Coordinator will coordinate training based on the needs of the program. Duties of instructing new members shall fall upon those who have the most flight time and knowledge of UAS operations. Instructors will be designated based on experience and competency with the UAS operation and approved by the UAS Program Manager.

Training Policies:

All members will have access to the monthly and yearly training plan. Training plans will be developed by PRD’s UAS Program Manager and will be implemented by approved UAS instructors.

All deployments and/or exercises will be documented and will count toward a member’s training. A third-party program management software will help track pilot logs and flight hours with each specific UAS platform. Each member of the UAS program has the responsibility to maintain their own training file and ensure the information is up-to-date, accurate and complete.

Initial Training:

All pilot candidates must complete PRD UAS ground school regardless if the person already possesses an FAA Part 107 license. Ground school will be supplemented with hands on flight training drills, the NIST UAS proficiency course, and mission specific training to ensure that all department RPIC’s have the skills necessary to safely operate a UAS in the field. The proficiency course is based on the National Institute of Standards and Technology (NIST) Guide to Measuring and Comparing UAS Capabilities and Remote Pilot

RPIC Certification Levels

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Pilots who qualify for **PRD UAS RPIC Level 1** have successfully completed all the requirements listed below and have been certified by a qualified PRD instructor on UAS for day missions only.

1. RPIC has a current FAA Part 107 Remote Pilot certificate

2. RPIC has completed the following PRD UAS RPIC Level 1 Course ground school topics:
 - Standard Operating Procedures
 - Mission Planning
 - Issuing of the Drills Handbook containing:
 - a. RPIC signoffs
 - b. VO signoffs
 - Logbook – Every RPIC shall keep a log of all training and operations flights – that includes such information as:
 - a. Date of flight
 - b. UAS make and model
 - c. UAS registration number
 - d. Flight location
 - e. Mission description
 - f. Flight start time
 - g. Duration of flight
 - h. weather
 - i. Maximum altitude

3. RPIC has completed the following PRD UAS RPIC Level 1 Course hands-on training:
 - Setup
 - Basic flight maneuvers
 - Using the cameras
 - Setting flight modes

4. RPIC has completed the following PRD UAS RPIC Level 1 Course proficiency tests based on the National Institute of Standards and Technology (NIST) Guide to Measuring and Comparing UAS Capabilities and Remote Pilot Proficiencies Using Standard Test Methods:
 - Hold position and altitude
 - Orbit a point
 - Fly straight and level
 - Identify and inspect objects
 - Land accurately

Pilots who qualify for **PRD UAS RPIC Level 2** have successfully completed all the requirements listed below and have been certified by a qualified PRD instructor on a specific aircraft for both day and night missions.

1. RPIC has a current FAA Part 107 Remote Pilot certificate

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2. RPIC has completed all PRD UAS RPIC Level 1 Course requirements
3. RPIC has completed the following PRD UAS RPIC Level 2 Course ground school topics:
 - UAS Night Operations
 - How the Eye Works

 - Spatial Disorientation and Visual Illusions
 - Improving Your Night Vision
4. RPIC has completed the following PRD UAS RPIC Level 2 Course hands-on training:
 - Setup
 - Basic flight maneuvers
 - Night Camera Operations
 - Setting flight modes
5. RPIC has completed the following PRD UAS RPIC Level 2 Course proficiency tests based on the National Institute of Standards and Technology (NIST) Guide to Measuring and Comparing UAS Capabilities and Remote Pilot Proficiencies Using Standard Test Methods:
 - Hold position and altitude
 - Hold position and altitude
 - Orbit a point
 - Fly straight and level
 - Identify and inspect objects
 - Land accurately

A member is authorized to conduct flight operations as the PIC when the following criteria have been met:

- PIC Level 1 or 2 certification completed
- Minimum flight hours on each UAS platform as determined by the Program Manager or Coordinator
- PIC meets all initial and recurrent training requirement.

UAS VISUAL OBSERVER CERTIFICATION (VO)

A crew member qualifies as a Visual Observer for both day and night missions when they have successfully completed all PRD UAS Visual Observer Course topics listed below and have been certified by a qualified PRD instructor:

- UAS Operations
- Definitions and Roles
- Understanding Airspace, NOTAM's, and TFR's
- Night Operations
- How the Eye Works
- Spatial Disorientation and Visual Illusions

Any member that has the status of "pilot" may act as a VO while the PIC is at the controls of the UAS.

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Recurrent Training

All members shall maintain proficiency in their RPIC/VO abilities. In accordance with CFR§ 61.57 PRD UAS pilots must record at least three (3) takeoffs and landings in the preceding **90-days in each type aircraft**. Three (3) day for Level 1 RPIC's and both Three (3) night and day for Level 2 RPIC's.

RPIC's who do not meet the required documented training or flight time within the **90-day period** must have a flight currency review with the UAS Lead Instructor and be signed off by the UAS program Manager before they can be returned to full flight status.

Continuing education (CE) training will be provided to all UAS program members on a monthly basis, while on duty.

MISUSE/ABUSE

PRD personnel will follow all department policies outlined in this procedure for all UAS operations conducted by the department. The public may address UAS complaints through the City Manager's Office at contactus@phoenix.gov or the City's Integrity Line at city.auditor@phoenix.gov. Complaints needing immediate attention may be directed to the PRD customer service line (602) 495-5458. All complaints will be reviewed and properly investigated. PRD personnel found in violation of department policy may be subject to discipline up to and including termination as well as removal from the department's UAS program.

OPERATIONS

General Deployment Rules

- A UAS Team will only be dispatched on specific nature codes that fit within PRD UAS operational guidelines, and any approved FAA COA and/or waiver operational areas.
- Incident Commanders may special request a UAS Team to an incident via Phoenix Alarm Room Headquarters. As with every incident involving UAS response, it will be up to the UAS Team to determine if the UAS can be deployed safely to achieve the mission objective.
- All requests for UAS flights will be made through the Program Manager.

PRD's UAS will be given the designator of "**Drone 1**" during all flights. Subsequent UAS's deployed will be given "**Drone 2**" and so on. This designator is subject to change at any time as determined by the IC, Operations, or the UAS Program Manager.

No pilot may act as a PIC for more than 10 hours in any 24-hour period.

The Pilot in Command (PIC) will determine if the UAS can be deployed safely, and practically, and will either accept or decline the flight request.

The pilot is ultimately responsible for the UAS operation and their authority is absolute.

If the mission is accepted, the following will take place:

- The pilot will announce when Air Operations is on scene.

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- The pilot will make an on-scene assessment of the conditions and determine if the UAS can fulfill the requested goals of the mission.
- The IC will contact AHQ and request a secondary radio channel to be used for flight team communications when needed.
- Normal pre-flight operations will be initiated including the filing of a NOTAM when required.

No member of PRD (or any other entity), regardless of rank, may order a pilot to:

- Accept a mission.
- Fly outside of FAA, Certificate of Authorization (COA), or manufacturer's parameters.
- Violate any rules or regulations that the PIC feels would put first responders, members of the public, or the flight team at a greater risk than is normally assumed with flight operations.

Should a pilot decline a mission, the pilot must make a written declaration outlining the reason(s) why the mission was not accepted and submit the draft to the Program Manager where it will be reviewed and forwarded to the Homeland Chief.

SAFETY POLICY

If any UAS Team member observes or has knowledge of an unsafe or dangerous act within the UAS Program shall be communicated to the Program Coordinator immediately. Management will not initiate disciplinary action against personnel who, in good faith, disclose a hazard or safety occurrence due to unintentional conduct. It is the duty of every UAS Team member involved in any UAS flight to contribute to the goal of continued safe operations. Any safety hazard, whether procedural, operational, or maintenance related should be identified as soon as possible. Conduct regular audits of safety policies, procedures, and practices. Monitor the UAS community to ensure best safety practices are incorporated into the organization.

GROUND SAFETY

- The UAS Team will identify and secure a safe location within the operational area for UAS launch and recovery.
- Only mission essential personnel will be in proximity to UAS launch and recovery activities. When operating near populated areas, the pilot will ensure that a "defined incident perimeter" exists to limit the potential of persons being present beneath the UAS flight path.
- The pilot and flight observer must always be aware of dangers to ground personnel from moving rotors.
- The pilot shall under no circumstances leave any unauthorized person in charge of the UAS controls while the UAS is running.
- If it is necessary for the pilot to leave the controls of the UAS, the engine will be shut down, battery removed, and the controls deactivated.
- A pre-flight checklist pertinent to the specific UAS to be flown will be utilized to perform the required checks and risk assessment.

WEATHER

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Before launch, a thorough check of the weather will be conducted, and all members of the flight team will be made aware of the findings.

Weather information can be obtained through two primary means

- FAA approved weather resources
- An anemometer

Weather information obtained during the pre-flight phase will be documented in the flight log.

PRE-FLIGHT

Team members will conduct a pre-flight assessment of the incident environment to ensure the proposed operation is within COA guidelines and Department UAS Policy. The UAS team will determine if safe operation of the UAS can be accomplished. The decision will be contingent upon several factors to include physical features of the area, obstructions to flight, terrain, and the weather. The UAS PIC will make the final determination if flight operations can be initiated.

Before launch, the designated PIC and VO must complete a thorough pre-flight inspection. The pre-flight checklist will be utilized to perform the required checks and risk assessment.

(The pre-flight checklist can be located in the Forms Appendix A)

NIGHT FLIGHT OPERATIONS

- UAS team members should obtain the minimum altitude necessary to avoid obstructions in the operating area prior to nightfall if possible.
- Due to field of view and distortion issues, night vision goggles may not be used as the primary means for visual observation duties. Such devices are **ONLY** permitted for augmentation of the Flight Observer's visual capability.
- Flight Observers must use caution to ensure the UA remains within normal line-of-sight.
- The use of UAS Staff and the use of lighting and/or IR beacons to identify the launch/recover areas is highly recommended.
- A Visual Observer (VO) **must be used at night.**

DECONFLICTION OF AIRCRAFT

- All UAS flights shall be grounded upon arrival of approved government manned aircraft entering the operational air space unless coordinated flight training has occurred with that agency. ie. Firebird
- Deconfliction shall occur by the Lead PIC of the aircraft.
- It is the responsibility of the UAS pilot and Flight Observer to confirm and maintain awareness of all manned aircraft activity during UAS operations.
- In the event a non-Department UAS is identified within the operational air space, the Lead PIC shall notify the Incident Commander and immediately follow incursion protocols.

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POST-FLIGHT

- After landing, a thorough post-flight inspection of the UAS must be completed by the designated PIC and VO. A post-flight checklist shall be utilized for the inspection procedure.
- Any decontamination will be performed in strict accordance with the specifications and guidelines of the UAS manufacturer.
- UAS deployment report will be stored for review as needed.

(The post-flight checklist can be located in the Forms Appendix A)

MANNED AND UNMANNED JOINT OPERATIONS

Factors commonly contributing towards airspace conflict for public safety manned and unmanned aircraft include notification of presence, lack of or poor communications, and lack of or inadequate policies, procedures, and training to support interoperability. To ensure safe, coordinated, and effective response of aerial resources, an accountability system shall be implemented at all incidents where aircraft are utilized. The system is only effective if all participating agencies commit to it.

PRD UAS will not fly in the same airspace as other public safety or government agencies unless inter-agency deconfliction training has occurred and both agencies have signed off as being proficient. For example, deconfliction training with Phoenix PD “Firebird” does not clear PRD UAS to fly in the same airspace as DPS “Ranger”. Separate deconfliction training is required.

POLICY

- Manned aircraft take priority and have precedence over airspace.
- Both manned and unmanned resources shall establish and maintain communications.
- All aerial resources shall establish and maintain separation assurance standards through the demarcation of altitude, horizontal distance, and /or geographical areas of operation.

COMMUNICATIONS

During both training and emergency incident response, radio communications shall be established and maintained between both the manned and unmanned aircraft.

Typically, all Air Operations communications (manned and unmanned) take place on the assigned Air Ops channel. For example, an Air Operations channel is assigned to emergency response incidents that occur within Maricopa County.

A second option is the air-to-air frequency of **123.025**; however, this is currently only available on ARFF department radios.

If no communication has been established, the UAS shall land immediately upon hearing or seeing any public safety aircraft until positive communication is established.

Separation Assurance Standards

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Operations may occur up to a maximum altitude of 400 feet AGL or, if higher than 400 AGL, remain within 400 feet of a structure unless otherwise approved by waiver. Most UAS operations take place at 200 feet AGL or below.

When working in joint airspace, safe separation of aircraft shall be maintained through altitude, horizontal distance, and /or geographical areas of operation such as using roads, rivers, or other natural dividing lines to deconflict the air space. The RPIC shall establish direct communication with the manned resource and develop the necessary separation clearances.

If communication cannot be established, or separation cannot be maintained, the UAS shall give right-of-way to the manned aircraft and return to its landing area until flight becomes safe again.

LOST LINK / GPS PROCEDURES

Lost link is an interruption or loss of the control link between the control station and the unmanned aircraft. This prevents control of the aircraft and results in the aircraft performing pre-set lost link procedures. While operating in controlled airspace, in the event of a lost link that cannot be re-established within a reasonable time, a designated crew member shall immediately notify the appropriate authority.

When possible, lost link and lost GPS procedures shall comply with the following:

- The aircraft autopilot will enter a lost link mode within 10 seconds of the lost link condition being detected, return to the LZ or other defined lost link waypoint within the UAS operating area, and land.
- If the aircraft loses GPS, the RPIC will immediately attempt to land the aircraft in a safe location by controlling it manually or landing at the current location within the operating area.
- If both GPS and data link are lost, the aircraft will automatically land at the current position.

EMERGENCY FLY AWAY PROCEDURES

In the event of a fly-away or other emergency scenario while operating in controlled airspace, the designated crew member shall immediately notify the appropriate FAA authority and Sky Harbor Aviation Department Airport Duty Manager (602) 273-3388, and provide the following information:

- The nature of the emergency
- Last known aircraft position, altitude, and direction of flight
- Maximum remaining flight time

LOST SIGHT

If a VO loses sight of the aircraft, the VO shall immediately notify the RPIC. The RPIC shall place the aircraft into hover mode while the RPIC and VO try to reestablish visual contact with the aircraft. If the aircraft is visually reacquired promptly, the mission may continue. If visual contact is not reacquired within a reasonable period of time, the RPIC shall initiate the Return to Home sequence.

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For operational necessity, the RPIC or person manipulating the controls may intentionally maneuver the UAS so that they lose sight of it for brief periods of time. In this case, the RPIC must regain VLOS as soon as practicable. For example, a RPIC stationed on the ground utilizing a UAS to inspect a rooftop may lose sight of the aircraft for brief periods while inspecting the farthest point of the roof. As another example, a RPIC conducting a search operation around a fire scene may briefly lose sight of the aircraft while it is temporarily behind a dense column of smoke.

However, it must be emphasized that even though the RPIC may briefly lose sight of the UAS, the RPIC always has the see-and-avoid responsibilities set out in Part 107, §§ 107.31 and 107.37. The circumstances of what would prevent a RPIC from fulfilling those responsibilities will vary, depending on factors such as the type of UAS, the operational environment, and distance between the RPIC and the

UAS. For this reason, there is no specific time interval that interruption of VLOS is permissible, as it would have the effect of potentially allowing a hazardous interruption or prohibiting a reasonable one.

(See the Contingency Plan Checklist in the Forms Appendix B)

DOCUMENTATION

Each flight will be recorded in both the UAS department's flight log and the pilots personal flight logbook.

A "UAS Deployment Report" must be submitted any time a UAS Team is deployed on a training mission or active incident. This report will be submitted to the Operations Chief and the Shift Commander.

MEDICAL FACTORS

The health of the flight crew is paramount and any member of the UAS program must stand down if they feel they are not able to perform their duties to the highest level.

A self-assessment of physical condition shall be made by all flight crewmembers during pre-flight activities.

No member shall act as a PIC or a VO within eight hours (8) after consumption of any alcoholic beverage.

DATA COLLECTION and USE

The Phoenix Parks and Recreation Department will only collect information using UAS or use UAS-collected information, to the extent that such collection or use is consistent with and relevant to an authorized purpose.

UAS flight data, whether training or incident related, will be recorded in a "flight log" specific to each UAS owned by the department.

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A UAS digital media file may be utilized as a training tool for specific units or the department as a whole. Parks and Recreation Department personnel requesting utilization of a UAS digital media file for training purposes shall submit their request to the UAS Program Manager.

In most cases, “real time” information will be captured solely to transmit “live” footage to a project team assessing a site. Although there may be occasional benefits to sharing, recording, and retaining visual data, this is **NOT** the intended purpose when a UAS is launched in public space or in and around public property or domains.

DATA RETENTION

All pictures and videos captured during a flight will be stored in accordance with the City and Parks and Recreation Department’s Data Retention Policy. It will be the Department’s policy and practice to record visual data only where there is a specific, identified departmental need.

Unauthorized use, duplication, and/or distribution of UAS digital media files is prohibited. Personnel shall not make copies of any UAS digital media files for their personal use and are prohibited from using recording devices (such as personal camera, tablets, or smart phone) or any secondary video camera to capture UAS systems media including the retention of video cached on the web. All recorded digital media: images and audio are property of the City of Phoenix Parks and Recreation Department and shall not be copied, released, or disseminated in any form or manner outside the parameters of this policy without the expressed written consent of the Deputy Director.

Information, or data collected from the deployment of PRD UAS in analyzing sites will be stored in a manner and duration that allows it to be utilized over time to be beneficial in assessing the condition and progress of restoring and preserving the City’s mountain parks and preserves.

Requests for UAS digital media, including requests from Federal Prosecutors, State Attorney General’s Office, County Attorneys or City Prosecutor’s Office, shall be forwarded to the Phoenix Parks and Recreation Department Personnel Division, with sufficient information to locate the specific UAS file.

Photographic and video data that is collected will be retained in accordance with Parks and Recreation Department Policies and Records Retention Schedule. This will be determined by the nature of the material in question. Training footage may be retained or purged as needed.

DATA STORAGE

PRD personnel will utilize only hardware/software storage systems approved by the Department’s Information Technology Section and in accordance with existing Department policies and procedures. All digital media captured on the UAS micro-SD card will be uploaded to PRD UAS data storage system at the conclusion of each UAS mission.

REQUEST for DELETION of ACCIDENTAL RECORDING

In the event of an accidental activation and/or recording, the recording employee will contact the UAS Manager and request that the UAS digital media file be deleted by PRD UAS redaction personnel.

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The UAS Manager and the Public Affairs Chief shall review the file and affirm that the file does not contain images that represent a breach of privacy or have evidentiary value and make a recommendation to the Deputy Director to approve or deny the deletion request.

DISSEMINATION of INFORMATION

Dissemination, outside of PRD, of UAS-collected information shall **NOT** take place unless required by law, fulfills an authorized departmental purpose, or complies with existing City and/or department requirements. UAS data can be obtained through a formal Phoenix Parks and Recreation Department records request.

UAS SPECIFICATIONS and DATA SECURITY

Global Positioning System - All PRD UAS will have a global positioning system.

Obstacle Avoidance - All PRD UAS will be equipped with obstacle avoidance.

Remote I.D. – **Currently in litigation.** (RDQ v. FAA)

Software/Firmware Updates - PRD will ensure the software and/or firmware used to operate each unmanned aircraft is kept up to date and maintained. The Program Coordinator will be responsible for overseeing this. The UAS Team will confirm that updates are current prior to each use. The UAS will not operate until the software update has been completed.

Aircraft Features - No PRD UAS may be modified or be used in a way that would be reasonably considered to distract drivers, or other aircraft.

Radio Frequencies - During flight operations, the UAS will use assigned radio frequencies and antenna equipment authorized by the FAA.

Airworthiness - The PIC will be responsible for ensuring the UAS is flight ready according to manufacturer recommendations and any related industry standards. A pre-flight checklist will be utilized prior to **ALL** UAS flights.

Strobe – All PRD UAS that operate at night must have a strobe light that meets FAA night visibility regulations and an adequate flash rate that is visible for 3 statute miles.

INVENTORY MANAGEMENT

PRD UAS Coordinator will maintain the following UAS inventory records:

- The serial number, make, and model of each PRD UAS.
- The secured location where each PRD UAS is stored.
- A description of the technologies and capabilities associated with each UAS.
- Dates upon which new updates to the UAS or associated technology are required.
- Track UAS lifespan and replacement.

CYBER SECURITY

PRD personnel will follow cyber security best practices governing the use of UAS. This includes efforts to protect the UAS and any recorded data from cyber tampering or attack.

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PRD UAS personnel shall use best practices to secure UAS from electronic tampering, including hijacking, over the command and control (C2) data link, (which is the wireless communication to the ground control station)

PRD UAS personnel will maintain an understanding of the latest threats and vulnerabilities and will ensure all manufacturer UAS cyber security protections (software updates, patches, etc.) are current.

PRD UAS personnel will ensure that any operational data and/or imagery data collected and stored on either the UAS SD Card or the onboard hard drive is encrypted, when possible, in the event a department UAS is stolen, misplaced, or lost.

PRD will only operate UAS hardware and software approved by the City's Technical, Security, and Privacy subcommittee.

All recorded photo/video material related to a PRD UAS emergency response shall be archived and cataloged immediately after the conclusion of the incident.

MAINTENANCE

The UAS Program Coordinator or their designee will oversee the maintenance of the department's fleet.

The PIC is responsible for any general maintenance or updates of their UAS before and after each flight.

Warranty work, repairs and service will be handled by the UAS manufacturer or a certified third-party vendor that has been approved by the UAS manufacturer.

STORAGE & TRANSPORT

PRD UAS will be stored in a protective pelican case and housed in a temperature-controlled secure location.

The UAS will be stored in the pelican case during transport.

LIABILITY INSURANCE

PRD will comply with City of Phoenix Risk Management and Law Department requirements related to UAS operations.

INCIDENT/ACCIDENT REPORTING

The pilot in command will immediately report any loss or damage to any part of the UAS to the Program Manager or the Program Coordinator.

If an incident or accident occurs resulting in property damage of \$500.00 or more, loss of consciousness or injury requiring an overnight stay in a hospital, the pilot in command shall be

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responsible for reporting the incident to the FAA within 10 days of the event along with any additional documentation that may be required.

The UAS Pilot in Command will complete a Departmental Accident Report detailing the circumstances of the incident, accident, or injury. The Program Manager will forward the report to City's Risk Management and the Department's Accident Review Committee.

FORMS APPENDIX:

Appendix A: Flight Checklist

UAV Preflight Checklist

- Scan ground, sky, take-off, and landing area for obstacles that may interfere with the UAS
- Wind check
- Confirm mission flight plan
- Flight crew briefing (example, flight mission and safety)
- File daily flight report
- Assemble UAS
 - Visual condition inspection of the UAS components such as:
 - Airframe structure and attachment points
 - Moveable control and flight surfaces
 - Propulsion system including powerplants, propellers, motors, and ducted fans
 - Servo motors including attachment points
 - Registration displayed and legible
 - Batteries charged and securely mounted
 - Equipment (for example, a camera) securely attached
 - Get LAANC approval

Turn on Control Unit and Aircraft (in that order)

- Verify all systems (for example, aircraft and control unit) have an adequate energy supply for the intended operation and are functioning properly
- Control unit:
 - Antennas set to correct orientation
 - Display panel, if used, is functioning properly
 - Control link correct functionality is established between the aircraft and the CS
 - Sensor / Camera setting check
 - Verify communications with UAS and that the UAS has acquired GPS location from at least 4 satellites
 - Set/Confirm RTH
 - Check flight termination system, if installed
 - Confirm SD card is inserted and formatted
 - Update Home Point

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- Aircraft:
 - Inspect propellers for any imbalance or irregular operation
 - Final airframe inspection
 - Check ground support equipment, including takeoff and landing systems, for proper operation
 - Wind check again for launch

In-Flight Checklist

- Launch UAS
- Aircraft reached safe altitude
- Hold hover for 10 seconds
- 360 L/R
- Forward / Backward 10 feet
- Up / Down 10 feet
- Satellite and GPS check
- All systems green
- Cleared for flight

Before Landing

- Ensure UAS flight completed according to mission plan
- Scan landing area for obstacles
- Wind check
- Observer briefing for landing
- All systems green
- Land UAS (observe traffic patterns when applicable)

UAS flights should be completed with 15% energy reserves (fuel or battery) remaining or a 5-minute reserve or the manufacturer recommendation, whichever is greater.

Post Flight Checklist

- Power down UAS
- Decontaminate UAS if necessary
- Remove and safely store batteries
- Inspect Airframe
- Check SD card data to confirm data collected
- Transfer data and flight log
- Complete Pilot logbook entry
- Complete UAS deployment report

Back at Office

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- Maintenance report filed if any performed
- Charge batteries
- SD card cleaned and ready to use
- Process and store data

Appendix B: Contingency Plan Checklist

DRAFT

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Event	Result	Procedure
Battery depletes	Unmanned aerial system (UAS) incapable of continuing flight operations.	UAS return to base (RTB) as soon as practical; cease data collection.
Ditch Procedures	UAS incapable of continuing flight operations.	Identify safe landing area; attempt a controlled landing; if able, land UAS in water (shallow preferred for ease of recovery) away from public.
Fuel Depletes	UAS incapable of continuing flight operations.	UAS RTB as soon as practical; cease data collection.
Hazardous Weather	UAS incapable of continuing flight operations.	UAS RTB as soon as practical; cease data collection.
Hostile Environment	Mission impacted by hazard (for example, air traffic, public activity).	See and avoid; take evasive action as required with safety taking precedence; UAS RTB as soon as practical.
Loss of Communications	Mission impacted by lack of communications hazard.	Maintain visual line of sight (VLOS); take evasive action as required with safety taking precedence; UAS RTB as soon as practical.
Loss of Control Signal	UAS not controllable.	Maintain VLOS; UAS RTB and land without harm to UAS or contacting surrounding objects.
Loss of Direct Visual	UAS could become a hazard if unable to regain visual control.	Regain direct visual of UAS; contact mission payload operator and/or visual observer to determine status.
Loss of GPS Signal	Use extreme caution as the positional data for the UAS will not be accurate.	Assume manual control of the UAS; Maneuver and climb UAS to reacquire GPS signal; if GPS signal cannot be reacquired, determine whether safe UAS control can be maintained. If safe flight cannot be maintained, land as soon as practical.
Loss of Situational Awareness (SA)	UAS could become a hazard if unable to regain SA.	Climb to a safe altitude; reorient with use of sensors; RTB if required.
Privacy Impact	Possible public complaint.	Cease data collection; RTB and complete an assessment.
UAS Failure	UAS incapable of continuing flight operations.	Maintain VLOS; UAS RTB as soon as practical.

Appendix C

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Tower Notification Contact List

Notify when operating within 5 miles of the airport when LAANC system is down.

For operations that require a waiver through the Special Governmental Interest (SGI) process, requests should be submitted to the FAA by filling out the **Emergency Operations Request Form** and send to the FAA's System Operations Support Center at 9-ator-hq-sosc@faa.gov (See Appendix D for SGI Emergency Operations Request Form)

Chandler Tower	480-782-3540
Deer Valley Tower	623-869-0975
Falcon Tower	480-641-4111
Glendale Tower	623-932-4550
Goodyear Tower	623-932-4550
PHX-Gateway Tower	480-988-7708
Scottsdale Tower	480-312-2321
Sky Harbor Tower	602-273-3300

Appendix D

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FAA REQUEST FORM FOR EXPEDITED SGI WAIVER OR AUTHORIZATION FOR UAS OPERATION	
<u>Basic Qualifications</u>	
<input checked="" type="checkbox"/> The requesting operator must possess a Certificate of Waiver or Authorization (COA) or Part 107 Pilot License <input checked="" type="checkbox"/> The UAS operation must support an emergency response or other effort being conducted to address exigent circumstances and that will benefit the public good <input checked="" type="checkbox"/> The requested FAA approval cannot be secured via normal processes in time to meet urgent operational needs	
<u>Operator Information</u>	
Mandatory entry	
Operator Organization (e.g., agency or company)	
Operator Address	
Operator Point-of Contact (including name, office + mobile phone number, and email)	
Pilot and Observers (including names, mobile phone numbers, and emails)	
Type of UAS	
<u>Documentation</u>	
If the requested UAS operation will be flown under a pre-existing COA, please attach it hereto and provide the COA number below.	
If the request UAS operation will be flown under Part 107, please provide the Part 107 Pilot License number below.	
<u>Requested Flight Details</u>	
Enter the date(s) of the proposed UAS operation (e.g., 03/18/2018 or 03/18/2018-03/21/2018) Mandatory entry	
Enter the times of the proposed UAS operation (be sure to confirm time zone; e.g., 1200L-1400L daily) Mandatory entry	
Enter the location of the proposed flight (reference the nearest city or town, and state; e.g., Gulfport, MS)	
Enter the distance and direction from the nearest airport, and FAA identification of the same (e.g., 6 NM W of GPT)	
Identify the class(es) of airspace in which the flight will be conducted (e.g., Class G/E/D/C/B/A)	
SOSC 2018/03/14 1235Z	1 2

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Requested altitude of UAS flight: Mandatory entry	
Enter GIS details defining location of proposed flight (only one area type description needed) Mandatory entry	
For those flights remaining within a general contiguous area, which can be described as a circular polygon, provide the latitude and longitude, expressed as degrees/minutes/seconds , of the center of that area and the radius of that same area (e.g., XX:XX:XXN / XXX:XX:XXW - .25NM radius)	
For those flights remaining within a general contiguous area, which cannot be easily described as a circular polygon, provide the latitude and longitude, expressed as degrees/minutes/seconds , of the vertices of the general area starting with the most northerly point and then progressing clockwise (e.g., (XX:XX:XXN / XXX:XX:XXW; XX:XX:XXN / XXX:XX:XXW; XX:XX:XXN / XXX:XX:XXW)	
For those flights following an extended route, provide the latitude and longitude, expressed as degrees/minutes/seconds , of the key waypoints of the route, and, as appropriate provide the width of the route (e.g., XX:XX:XXN / XXX:XX:XXW; XX:XX:XXN / XXX:XX:XXW; XX:XX:XXN / XXX:XX:XXW; XX:XX:XXN / XXX:XX:XXW - .25NM wide)	

Nature and Description of Event	
Enter the type of urgent UAS operation to be flown	Description of event
<input type="checkbox"/> Firefighting <input type="checkbox"/> Law Enforcement <input type="checkbox"/> Search and Rescue	
<input type="checkbox"/> Local / National / Natural Disaster	
<input type="checkbox"/> Other (specify below)	

Additional Pilot Qualifications	
Enter additional pilot qualifications	
<input type="checkbox"/>	Sport/Recreational/Private pilot certificate
<input type="checkbox"/>	Commercial/Airline pilot certificate
<input type="checkbox"/>	Flight instructor certificate

Contacting the SOSC	
The SOSC office and email are staffed/monitored 0600-2400 Eastern Time. For all emergencies, please follow up any email with a phone call to 202-267-8276, which is answered 24/7 .	

Appendix B

NOTAM Filing Procedures

Electronic:

1. Go to: 1-800wxbrief.com
2. Username:
Password:
3. Click **UAS** along top ribbon
4. Under **UAS Management**, click **Planning**
5. Enter required information
6. If including GPS coordinates, enter the coordinates in degree, minute, and seconds using the format: DDMSSNDDMMSSSE

Example: 472027N0114441E → 47° 20' 27' 'N 011° 44' 41' 'E

Telephonic:

1. Obtain GPS coordinates prior to calling.
2. Call 1-877-487-6867
3. Enter **22**
4. Enter **1**
5. Speak to a “**Flight Data Specialist**”
6. Provide required information

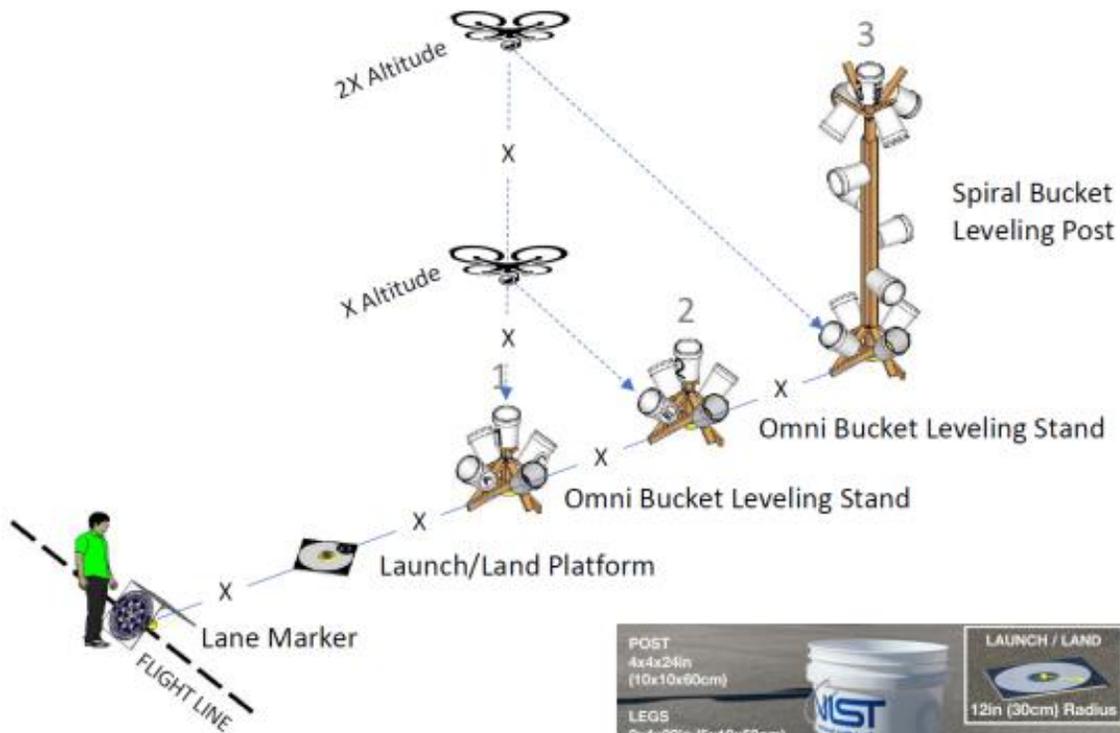
Appendix C: Building the UAS Proficiency Course

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The proficiency course is based on the *National Institute of Standards and Technology (NIST) Guide to Measuring and Comparing UAS Capabilities and Remote Pilot Proficiencies Using Standard Test Methods*.

For information about the NIST course, and for detailed setup steps, including printable stickers, see the *NIST Standard Test Methods for sUAS_v20190905.pdf* that is included with this program.



Setup Options

Depending on the tests that you want to use, there are two options for building your test lane:

- Two Omni bucket levelling stands + one Spiral bucket leveling post, or
- Three Omni bucket levelling stands

Lane Features

- Pilot flight line for safety (A-frame as lane marker).
- Centerline using 100ft (30m) measuring tape.

