Unmanned Aircraft Systems Operations Standard

for Law Enforcement Agencies

LEDA

LAW ENFORCEMENT DRONE ASSOCIATION

Published September 1st, 2023

COPYRIGHT

LEDA UAS Operations Standard
Law Enforcement Drone Association
1574 Coburg Rd, Suite 863, Eugene, Oregon 97401
Published September 1st, 2023

LEDA Mission Statement

The mission of the Law Enforcement Drone Association (LEDA) is to create and implement best practices and standards of training for the use of Unmanned Aircraft Systems (UAS, or drone) technology in Law Enforcement.

LEDA Vision Statement

LEDA strongly believes drone technology is the future of law enforcement to preserve life, mitigate risk and provide an unmatched level of police service. LEDA is committed to serving Law Enforcement Agencies and those who serve their communities with training, administrative support, certification standards, safety implementation and professionalism to enhance the international adaptation of the use of drone technology for Law Enforcement applications.

LEDA

Standards Review Committee

Jon Beal - President/CEO, LEDA, Former Police Sergeant, Gresham Police Dept. (OR)

Kyle Williams - Vice President/COO, LEDA, Police Sergeant, Eugene Police Dept. (OR)

Doug Seirup - Sergeant at Arms/CMO, LEDA, Detective, Benton County Sheriff's Office (OR)

Scott Dickerson - Secretary, LEDA, Sergeant, Bend Police Dept. (OR)

Todd Young - Treasurer/CFO, LEDA, Deputy, Clark County Sheriff's Office (WA) (Ret)

Mike Amend - Steering Committee Member, LEDA, Sergeant, Gresham Police Dept. (OR)

Chad Karlewicz - Board Member At-Large, LEDA, Commander, Renton Police Department (WA)

Brandon Karr - Board Member At-Large, PIO, LEDA, Former Police Officer, Pearland Police Dept. (TX)

David Barker - Steering Committee Member, LEDA, Police Officer, Idaho Falls Police Dept. (ID)

Rob Robertson - Steering Committee Member, LEDA, Sergeant, Arlington Police Department (TX)

Mark Kannen – Advisory Board Member, LEDA, Attorney, City of Eugene, Oregon

Disclaimer for Standards Document for the Use of UAS by Law Enforcement Agencies

This Standards Document ("Document") is published by the Law Enforcement Drone Association ("LEDA"), a professional organization committed to promoting the safe and responsible use of unmanned aircraft systems ("UAS") within law enforcement agencies. The information, recommendations, guidelines, and best practices (collectively, "Information") contained in this Document are intended to serve as a resource for law enforcement agencies, personnel, and stakeholders involved in the operation of UAS. The purpose of this Document is to provide a framework for the safe, lawful, and effective use of UAS in various law enforcement contexts.

While LEDA has made reasonable efforts to ensure the accuracy, completeness, and reliability of the Information presented in this Document, LEDA makes no warranties, express or implied, regarding the content or suitability for a particular purpose. The Information is provided "as is," and the use of such Information is at your own risk. The implementation of any practices or procedures outlined in this Document does not guarantee safety, effectiveness, or legal compliance.

It should be understood that the operation of UAS carries inherent risks and that no set of guidelines, including those outlined in this Document, can entirely eliminate the potential for accidents, injuries, or damage. Additionally, laws and regulations governing UAS use are subject to change and may vary by jurisdiction. It is the responsibility of each individual and organization to remain informed about and compliant with all applicable local, state, and federal laws and regulations.

LEDA disclaims all liability for any damages, injury, losses, or claims of any nature arising directly or indirectly from the use of, or reliance upon, this Document or the Information it contains. By using this Document, you agree to indemnify, defend, and hold harmless LEDA, its officers, directors, members, and agents, from any and all claims, including but not limited to legal fees, arising from your use of the Document or your failure to comply with any provision of this disclaimer.

Your use of this Document signifies your understanding and acceptance of these terms.

Section 1 - Scope, Capabilities and Policy

1.1 Scope of Standard

The scope of this standard includes theory and principles that relate to the organizational structure, training, operational tactics, Crew Resource Management (CRM), and equipment of law enforcement drone teams. The standard will not dictate how member agencies will create or apply any specific policies as it relates to drone use, but rather provide guidance and strong recommendations based upon the terminology, collective opinion, experience and expertise of the LEDA organization and its stakeholder partners. LEDA understands as time and use cases progress, so will this document. We will continue to reevaluate these standards annually for any adjustments that need to be made and will release updated standards as tactics, best practices and experience dictates.

1.2 Defining Drone Operations for Law Enforcement

LEDA recognizes that there are various types of use cases for drones in law enforcement operations. The implementation of a drone program for a law enforcement agency may vary depending on a number of factors. First and foremost is the agency's ability to dedicate the personnel and resources to a UAS program. LEDA continually states that your agency does not have a "UAS program" just due to the fact it has purchased a drone. There must be an understanding that in order to garner legitimacy and professionalism, there will be much more required of a law enforcement agency on the topic of drone programs.

LEDA understands there will be varying degrees of commitment to the craft and program, and different agencies will use different terminology, team titles and platforms for their program. This document is meant to be a guiding principle for the implementation of any law enforcement agency when creating and implementing a drone program and, whether or not you use the same terminology, the principles, structure and best practices are the most important pieces of our mission in the creation of this standard.

Please refer to the Glossary at the end of this document for definitions to unfamiliar words or terminology.

1.3 Drone Capabilities for Law Enforcement

- Drones have the capability to enhance nearly every aspect of law enforcement. The following is a list of common drone uses for law enforcement. While each of these employ similar skills, they also all require different and unique training and experience.
  - Crime/Crash scene photography
  - Crime/Crash scene mapping through photogrammetry
  - Bomb Team support
    - Device surveying
    - Robot overwatch
    - Detonation confirmation
    - Gas/Chemical Detection
    - Evidence Documentation
  - Special Operations
    - Pre-operation surveillance
    - Operation overwatch
    - Interior integration
    - Fleeing suspect tracking / observation
  - Mass Gathering Events
    - Situational Awareness for Incident Commander
    - Safety of all involved
    - Traffic safety
    - Agitator observation
    - Threats to the public
    - Evidence documentation
    - Suspect Identification
    - Serious Crime Detection and Suspect Apprehension
  - Patrol Response
    - Fleeing suspect tracking or location
    - Area search, low and high ground
    - High risk / Felony vehicle stops

- - ■ Building search
  - ○ K9 Overwatch and Search Assistance
  - ○ Search and Rescue / Water Rescue
  - ○ Drone as First Responder (DFR)
    - ■ Gather important intel early
    - ■ Reduce response time
    - ■ Disseminate important information for responding officers

1.4 Agency Policy Governing Drone Use

A. Every agency utilizing drones in their operations *must* implement a policy governing the use of drones. This policy should cover in detail:
1) Privacy Concerns and Mitigation
2) Authorized Uses
3) Prohibited Uses
4) Media and Data Retention
5) Flight Authority (Part 107, COA, SGI, or all)
6) Weaponization of the platform
7) Accessibility of the policy to the general public
B. The following sections should be mandatory additions in an agency's UAS policy:
1) Policy should prohibit agency members not licensed or trained from operating drones, unless in a training environment and under the supervision of a licensed/trained pilot.
2) Policy shall require adherence to all laws and regulations governing the use of drones to include the FAA, state and local laws.
3) Policy should prohibit team members from tampering with or deleting **ANY** flight logs
C. Agency policies should include as a portion of the policy, or an appendix, an operations manual for detailed operational guidelines. We recognize that in some states it would be necessary for disciplinary reasons to have the manual separate from the actual policy. Examples of what the operations manual should cover include, but are not limited to:
1) Team structure
2) Team member expectations
3) Team training
4) Safety Management Systems

5) Preflight checklist (established based on the team's existing equipment)
6) Integration with Manned aviation
7) Standards and minimum requirements
8) Member deployment expectations
9) Call-out procedures
10) Equipment maintenance schedule
11) Training schedule
12) Budget

It is important to note that any team member has the final say in whether or not to deploy a drone if they are acting as the Remote Pilot in Command (RPIC).

The FAA gives the ultimate decision to launch to the remote pilot, not an agency supervisor, Chief, or Sheriff. It is important that each agency writes into their policy that the RPIC has the authority to decline to launch a drone for a mission if they are not able to launch for regulatory, statutory or safety reasons. ***It should also be written into the policy that the RPIC will not face disciplinary action for refusing to launch a drone for a legitimate, lawful reason.***

Section 2 - Planning and Structure

2.1 Operational Planning

The effort put into coordinating a pre-planned operation is vital to ensure the safety and efficacy of the mission. It is also important to check all the boxes appropriately and allocate enough resources to ensure a successful mission. A "Pre-Planned" Law Enforcement UAS mission (referred to as a "Planned Op") is an important part of the UAS Team's repertoire. The UAS Team should have designated mission planners amongst the team.

An effective operation requires planning not just before the mission, but as the mission is unfolding and debriefing missteps and lessons learned afterwards.

Examples of a Planned Op include, but are not limited to:

- Mass Gathering Events
- SWAT Warrant Executions
- Investigative Flights (under a search warrant) for an ongoing criminal investigation
- Community Outreach Event
- Planned Search and Rescue Mission

LEDA recommends the following be completed during the planning of a Planned Op:

A. The UAS operation plan should be documented in writing
B. The UAS Program Manager should pick a member of the team with experience in planning such missions to make the plan.
C. The plan should include the following:
    1) Goal of the Team's participation in the mission
    2) Event Intelligence report to include:
        i. Event Organizer
        ii. Counter Protest Intelligence
        iii. Threats of Violence
        iv. Critical Staging Area for Protesters
    3) Weather Mitigation
    4) Airspace Mitigation (UASFM)
    5) Brief description of the investigation and operation
    6) Number of team personnel needed for the mission
    7) Team member roles and responsibilities during the mission
    8) Number/type/callsigns of aircraft platforms needed for the mission
    9) Vehicles needed for the mission
    10) Launch Zone Location(s)
    11) Approach/Departure Corridors and procedures
    12) Emergency Landing Site location(s)
    13) Site Security/Hazard Mitigation
    14) Prescribed flight path, altitude and hold/loiter area(s)
    15) Leapfrog plan (battery maintenance plan)
    16) Data storage plan
    17) Radio channels assigned
    18) Any peripheral equipment needed
    19) Emergency Medical Plan for injuries during the event

D. The Op Plan should be approved by the Program Manager and/or Team Commander prior to execution.
E. Ample time should be given to the team member creating the plan in order to create a solid and workable plan, or to make any adjustments necessary prior to the execution.

During a Planned Op, we suggest assigning an "Element Leader" to lead the element of drone pilots/crew members and be the point of contact for the Incident Commander. The Element Leader can play the role of Air Boss during the mission, but can also fill in as needed in other roles and should be in the area where the aircrew is operating in order to maintain proper communication with them.

The UAS Team is there to support the Planned Op and should be viewed as a tool. The UAS Team should only launch at the discretion of the Incident Commander, so as to not kick off any action that the agency utilizing the UAS Team is not ready to address due to the presence of a UAS in-flight. (Ex. Drone is launched over a suspect's residence without notifying the IC and spooks the suspect. A perimeter and K9 are not in place and the suspect flees and adequate units are not ready to give chase or effect an arrest).

At the conclusion of the operation, the Element Leader should lead a debrief of the team's performance and assess what went well, what could have been improved upon and any other concerns outlined by anyone on the team. The team should also note any hazards located before, during or after the mission and document that in a written hazard report. The team should also conduct the required post flight checks after the mission.

2.2 Multi-Jurisdictional and Regional Drone Teams

Collaboration with regional partners can provide a significant enhancement to UAS response. Creating regional teams or strong partnerships support a framework of collaboration that will enhance operational coverage, provide additional tools to the region, and expedite the process of mutual-aid.

Training with regional partners provides opportunities for training creativity, and standardization of operations for times when multiple agencies are on the same

incident. Every UAS team currently operating should be reaching out to their regional partners and working towards close relationships to support each other's operations.

These relationships often transform into regional teams with added benefits to operational efficiency. If there is a neighboring agency to yours that currently operates a UAS program, we strongly recommend reaching out to them to at least train with them on a regular basis. If the opportunity arises for your agency to partner one or more neighboring agencies to create a Regional Drone Team, we encourage that type of cooperation as it can bring additional pilots, equipment and funding to the table.

2.3 Team Structure

The roles and responsibilities of each member of the UAS Team are equally important. It is also pivotal for the program manager of the team to have access to a member of command, who should have intimate knowledge of the operations and makeup of each team. We understand that in some departments, one member may play multiple roles or even all of them. This is not advised, though, as it could lead to burnout or too much task-saturation. The titles of the team members is just a standard terminology, but one that we believe will help delineate responsibility amongst the team and help prevent burnout. It also adds value to team member's roles on the team by elevating them to a leadership role.

For this reason, LEDA recommends each UAS team adhere to the following structure for their UAS Teams (understanding this structure is scalable depending on the personnel and equipment each department possesses):

Program Manager (PM): The person in charge of the team. The PM should be well-versed in the policies, procedures, FAA regulations, state and local law related to the use of drones for LE agencies to help regulate and form an effective team. For smaller agencies, the PM may also act as a PIC, TFO, VO or other crew member based on the needs of the mission. The PM is charged with the administrative needs of the team, tracking the training of the team, implementation of policy and procedures, annual reporting, and keeping up with pilot logs. The PM should hold a FAA Part 107 remote pilot license. During Planned Ops, the PM should take the role of an Element Leader or Air Boss, making sure the overarching needs of the team and operation are met and not neglected and be a voice for the team to the Incident Commander of the operation. The

PM is also responsible for managing and maintaining the program's FAA waivers, whether that be a COA or a Part 107 Waiver.

There may be, depending on the agency size and personnel, a role for both a PM and a team supervisor (Sergeant rank) within the team, where the PM manages the program, but relies on team supervisors to carry out supervision of squads of patrol pilots, much like a patrol supervisor would with their respective squads.

Chief Pilot: This position should be given to a trusted and respected member of the team, who has been proven to be a subject matter expert and has a desire to train. The Chief Pilot is charged with the formulation of training curriculum and standards within the team. This position can be filled by a police officer, deputy, special agent, or supervisor pilot on the team, but should be someone with at least two years of experience on the team.

The Chief Pilot works with the PM to ensure logs are filled out and training is scheduled in a timely manner, according to the policies of the department and in accordance with any federal, state and/or local laws. The Chief Pilot should also be forward-thinking and have a desire to push the team in new technology and procedures in accordance with the standards being pushed out by LEDA and those in the UAS community.

Logistics Officer (LO): This position is filled by any team member interested in maintaining and building out the equipment of the UAS Team. The LO is responsible for conducting regular maintenance and inspections on aircraft and equipment, as well as procuring new equipment.

The LO should be working with budget and finance departments to purchase equipment, apply for grant funding and also outfit UAS vehicles for the department. The LO shall complete the appropriate maintenance logs for each piece of equipment and submit those logs to the PM as needed. On a side note, maintenance doesn't stop at aircrafts, but also pertains to software and other technical equipment the team uses to perform their duties.

Safety Officer (SO): The Safety Officer is responsible for providing guidance, educational material and strategy on how the team maintains strong safety practices. The SO will train the team on the team's safety management system, hazard reporting,

emergency procedures, and other methods to reduce risk and liability to the team and agency as a whole.

Team Member: The team member, or remote pilot, is responsible for knowing and understanding the department's policies and procedures related to UAS use. The remote pilot is responsible for following all local, state and federal regulations regarding drone flights and to represent the team in a positive and professional manner. The remote pilot should be ready to be called out to an incident when off-duty and respond (as agreed to by department union representation, if required), utilize the appropriate platforms and techniques necessary to complete the mission.

Section 3 - Training and Risk Mitigation

3.1 Initial UAS Operator Training

LEDA members have come to understand the importance of a standard of training and a basis of knowledge for all UAS operators. LEDA believes strongly in the importance of having all operators on the same wavelength regarding standard operating procedures, basic flight skills, flight principles, aviation safety culture, and other best practices. All new operators should complete a Basic UAS Operator School with a MINIMUM of 40 hours of training, to include the 24 hours of training contained in LEDA's Basic UAS Operator curriculum.

A UAS pilot should have at least 40 hours of basic training encompassing, but not limited to, the following:

A. FAA Regulations under Part 107 and Part 91 (Public Aircraft Operations)
B. Department Policies and Procedures
C. State and Local Regulations related to UAS use.
D. Preflight/Postflight Checklists
E. Aviation Safety Culture
F. Crew Resource Management
G. Aeronautical Decision Making
H. Weather and how it affects the mission and platform
I. Thermography
J. Night Flight and Nighttime Visual/Optical Illusions

K. Platform Familiarization

L. Basic Flight Maneuvering including smooth orbits

M. LEDA NIST Flight Proficiency Skills 1 Certification

N. Scenario Based Training to include the following scenario types:

1) Person Follow
2) Airborne Search Techniques
3) Vehicle Follows
4) Indoor/Confined Space
5) Crash/Crime Scene Reconstruction - Autonomous Flight Programming
6) Search and Perch Method and practice
7) K9 Search Team Assistance
8) Night Ped Follow
9) Night Vehicle Follow
10) Barricade Vehicle
11) Nighttime Confined Space Entry
12) Variable Air Pressure Confined Space Ingress and Egress
13) Emergency Procedures - Signal Loss, ELS, Disturbance, ATTI Mode Flight
14) Leapfrog Techniques
15) Search Warrant Execution
16) Search and Rescue Operations
17) Water Rescues - if applicable

O. Data Retention and Security

P. Connectivity and Troubleshooting

Q. Search Warrant Templates and Language

R. Mapping practices

S. Standardized Video/Photo Capture of Full Crime/Crash Scene

3.2 Ongoing UAS Operator Training

UAS piloting skills are perishable and must be consistently maintained to ensure proficiency. It is crucial for team UAS pilots to prioritize skill retention. The complexity of UAS systems, including regular updates, maintenance requirements, and variations among different platforms, necessitates ongoing training.

LEDA understands our minimum recommendation may not be attainable by certain agencies upon the implementation of a drone program for various reasons, but we strongly believe that the more you train, the better you will be when it matters most. Ideally, pilots should be training 120 hours or more per year, however LEDA recommends a _minimum_ of 80 hours of annual training for UAS pilots. To maximize skill development and retention, it is advisable to distribute these training hours evenly throughout the year. These training hours can be completed through agency training, virtual (webinar) training, training conferences and/or regional, collaborative training events. This approach allows pilots to engage in various training activities, such as collaborating with other agency special teams, updating and maintaining equipment, flying different UAS platforms, and ensuring readiness for future emergencies.

By dedicating sufficient time to training, pilots can enhance their proficiency and stay updated on the evolving capabilities and features of UAS systems. Collaborative training with other teams fosters knowledge sharing and provides valuable opportunities to learn from diverse perspectives and operational experiences. Furthermore, dedicating time to equipment updates and maintenance ensures that UAS systems remain in optimal working condition and minimizes the risk of malfunctions during critical operations.

Moreover, providing pilots with opportunities to fly different UAS platforms expands their skill sets and adaptability, enabling them to effectively handle a range of mission requirements. This exposure to diverse systems also enhances their understanding of the complexities associated with different UAS platforms and improves their overall operational effectiveness.

By incorporating these recommended training practices, agencies can ensure that UAS pilots maintain their skills, stay up to date with equipment and software advancements, and are well-prepared to respond to emergencies and fulfill their responsibilities effectively.

3.3 Risk Mitigation

The use of drones in the law enforcement function carries inherent risks that need to be properly identified, assessed, and mitigated to ensure the safety of personnel, the public, and the overall success of the program. This section will outline the key considerations for risk mitigation during UAS operations in law enforcement, including actual flight risks and liability for the program.

These are the mitigation steps we recommend you instill into your program:

A. Preflight your aircraft(s) at the start of every shift.
B. Conduct Risk Assessments for the overall operation, including weather, hazards, pilot rest, etc.
C. If the drone was deployed at all, whether it was training or a mission, be sure to conduct the appropriate post-flight for that aircraft and all equipment, prepping it for the next shift.
D. Pilot training, qualifications and certifications, maintaining basic and advanced certifications as well as proficiencies are vital for the continued success of your program.
E. Create a consistent Preflight Process that is platform specific. Utilize the LEDA Preflight card as a template to create your own or use it as a standard guide for generic preflight.
F. Routine maintenance and inspections are essential to minimize the risk of equipment failures during flight operations. Develop a maintenance schedule for all sUAS equipment, including the aircraft, batteries, controllers, and any supporting hardware or software. Regularly inspect and test all components to ensure their proper functioning and compliance with manufacturer guidelines.
G. Establish clear operational procedures for UAS flights, including takeoff and landing protocols, flight patterns, altitude limitations, and emergency procedures. Ensure that all flight operations are conducted in accordance with applicable laws, regulations, and any local restrictions or permits. Regularly review and update these procedures to incorporate lessons learned and adapt to evolving industry best practices.

H. Maintaining effective communication and coordination among sUAS pilots, ground personnel, and other involved parties is crucial for safe and efficient operations. Establish a communication protocol that includes clear channels of communication, standardized terminology, and emergency contact procedures. Regularly practice and reinforce effective communication strategies through training exercises and simulations.

Members can reference the Federal Aviation Administration's (FAA) Risk Mitigation Handbook linked below for further information on safe aviation practices: https://www.faa.gov/sites/faa.gov/files/2022-06/risk_management_handbook_2A.pdf

Also, there is opportunity for continuing education on the FAA Safety website located below. There are a multitude of aviation related courses available for free with certificates given upon completion, linked below: https://www.faasafety.gov/

3.4 Liability for the Overall Program

The Law Enforcement Drone Association is committed to help make sure your program is built in a way that promotes safety and success. Audits (which can be conducted by a member of the LEDA training cadre or a trusted third party) are recommended of the program every 3-5 years depending on the amount of updating and changes made to your program from its inception. Keeping in line with the LEDA standard may help keep your program moving in the right direction with growth, effectiveness, transparency and risk reduction.

A. To mitigate liability risks associated with UAS operations in law enforcement, it is essential to comply with all relevant laws, regulations, and local ordinances. Stay up to date with changes in drone-related legislation and ensure that all operations adhere to the required permits, certifications, and authorizations.

B. Conduct a comprehensive risk assessment of the UAS program to identify potential liabilities and vulnerabilities. Seek professional advice to determine appropriate insurance coverage that adequately addresses potential risks, including liability for property damage, personal injury, and privacy violations.

Regularly review insurance policies to ensure they align with the evolving needs of the program.

C. Maintain thorough documentation of all UAS operations, including personnel training records, flight logs, maintenance records, and incident reports. Accurate recordkeeping serves as evidence of compliance, due diligence, and responsible operation. This documentation can be invaluable in managing liability claims and providing a transparent account of program activities.

D. Invest in comprehensive training programs for all personnel involved in UAS operations. Develop and regularly update standard operating procedures (SOPs) that emphasize safety protocols, legal compliance, risk mitigation, and ethical considerations. Ensure that all personnel are familiar with and adhere to these SOPs.

Section 4 - Use of Drones - Best Practices

4.1 Indoor Operations Standard

The purpose of utilizing a UASs indoors is to mitigate the risk to human life when interacting with a potentially armed and/or barricaded suspect. LEDA strongly suggests utilizing a UAS to visually clear structure(s) on tactical operations before sending personnel into the structure whenever feasible. The use cases will vary based upon the department's resources and needs, and the incident at hand.

The standard of indoor operations is completely scalable based upon your personnel and equipment. The purpose of inserting a drone(s) into a structure is to flood the structure with video cameras to gain intelligence about the mission and suspect inside. You can accomplish this with one drone operator or ten of them. UAS can be flown inside a structure with the RPIC located outside of the structure or inside the structure. For small structures, LEDA recommends that the RPIC be located outside of the structure as to not needlessly expose the RPIC to hazards inside the structure. For very large structures it may be necessary for the RPIC to be located within the structure. In these scenarios it is imperative that the RPIC is part of a team which provides protection

for the RPIC while they are flying. A variety of techniques can be utilized while searching a structure with UASs. This includes, but is not limited to, single entry point with one UAS, single entry point with multiple UASs, multiple entry points with multiple UASs, limited penetration with hover, perching and skipping.

It is important to note that with UAS, you can only visually search/clear a structure as much as the field of view of the UAS payload will allow. LEDA cannot stress enough that UAS operators shall not call a structure "Clear" at the conclusion of a UAS search of the inside of a structure. Equally important is training with your SWAT/Tactical teams so both the UAS and SWAT/Tactical teams understand the capabilities of the UAS and your operators, as well as understand the roles and responsibilities of each team during a mission.

The importance of recording the condition of the interior of a structure cannot be understated. When it comes to serious criminal prosecutions, the ability to have high quality video recorded of the interior and its condition prior to the entry of department personnel, equipment or canines could be key evidence to collect for investigators and prosecutors.

4.2 Outdoor Operations for Tactical Incidents

The utilization of UASs outdoors is to increase the safety of first responders and community members. LEDA advocates utilizing a UAS to provide situational awareness during calls for service whenever feasible. Drones provide air support at a fraction of the cost of traditional aviation and have several more uses. The on-board cameras provide an overhead perspective to obtain tactical intelligence about the incident. Having the ability to stream the video feed to the cell phones or mobile computers of the first responders, supervisors, and command staff, enhances situation awareness and resource allocation.

The scale of operations is always based upon the department's resources, needs, and the incident at hand. A drone can provide aerial intelligence in complex environments saving time and resources. This can be achieved with one or several drones. LEDA recommends a drone be utilized at an incident as "Overwatch" for situational awareness. If needed additional drones can be deployed to deescalate a situation,

more focused searches of yards, vehicles and structures. Multiple drones can be utilized to accomplish a goal but will require airspace deconfliction.

4.3 Canine Team Assistance

Drones are a pivotal tool for keeping ground search teams safe, as well as limiting risk and liability to the agency using them. LEDA strongly recommends teaming UAS personnel with K9 handlers as a standard practice for several reasons:

A. Drones can be deployed prior to the arrival of the K9 handler and conduct a small area sweep where the search will begin with the intent of avoiding a possible ambush scenario.
B. Once the K9 Handler and search team have deployed, the RPIC can "cast out" the drone just like the K9 handlers do with the dog and check the immediate areas in front of and around the search team, looking for the subject, as well as maintaining situation and geographical awareness for the team below.
C. Once the subject has been located, the aircrew can effectively guide the search team in for the approach while maintaining a visual on the subject and communicating the subject's actions to the team.
D. The situational awareness provided by the drone can help the incident commander(s) or team leader(s) on the ground make better decisions at a moment's notice and mitigate risk to the officers, subject and community members. Tactics can be changed and employed to safely bring the incident to a close and limit liability to the agency.
E. The aircrew can inform the K9 team of any potential hazards like dogs or residents in an upcoming yard, avoiding an unwanted confrontation or possible unwanted dog bite.
F. The aircrew can alert the K9 handler that the dog is "on the bite", letting the handler know that an approach and apprehension can be made, which can help reduce the injury to the subject the dog is biting.

It's very important to train with your K9 teams once your UAS team has been established so that both you AND your K9 handlers understand your roles and

LEDA

responsibilities during these kinds of missions, as well as understand the capabilities of your operators and equipment to better execute the mission.

4.4 Airborne Search Tactics

The standard for airborne search operations can be done in four repeatable steps. Starting with the basics of keeping CRM and ADM in mind, teams should always follow the four principles of LE aerial searches below:

A. Containment
B. Area Sweep
C. Area Search
D. Suspect Tracking

Physical containment is the MOST important part of searching for people. If physical containment is not properly in place, the suspect has opportunities to escape. For UAS Teams that deploy drones before physical containment is set, the UAS should be used to visually contain the scene until physical containment can be set.

As taught in our Airborne Search Tactics classes, once containment is set, pilots should conduct an Area Sweep of the contained area in a smooth orbit, or grid pattern, looking for the subject. This is done prior to actual searching tactics.

Once the sweep has failed, you move to a more methodical Area Search (yard by yard, lot by lot). This can run in tandem with the K9 or ground team. Pilots should not be moving the drone while searching, but instead allow the drone to hover, and search the area of the monitor or screen with their eyes. Once the search of the screen is done, the pilot can yaw/rotate to a new spot and repeat.

Once the suspect/subject has been located, communicate with the ground teams the location of the subject. If geographical locations are needed, DO NOT pan the camera off the subject. Keep the subject in frame and zoom out to get a better geographical eye on the area to provide a better description of the location.

If the subject avoids the camera and runs out of view again, fall back to the four principles, Sweep, and Search and locate the subject.

4.5 Scene Reconstruction

Employing UAS platforms for scene reconstruction mapping can drastically reduce processing time which in turn has less of an impact on the community and saves agencies money. There are several UAS platform options for scene processing. LEDA suggests utilizing a platform with a camera system equipped with a larger sensor and a global shutter.

Flight altitude will impact how much area you can map in one flight and the resolution of the final product. Altitude is often dictated by the environment at the scene. LEDA suggests a flight at the lowest reasonable altitude. As a general rule, we recommend 80% front overlap and 70% side overlap with a slight oblique camera angle. A double grid mission should be obtained for 3D scene reconstruction. A second flight at a lower altitude using an orbit mission can improve the final product. Scene control is a MUST to limit contamination during mapping.

Real-Time Kinematic (RTK) positioning equipped UAS platforms can help achieve survey grade accuracy but are not a *must*. Ground Control Points (GCP) can be used to rectify the 3D model by using a known coordinate system or arbitrary coordinate system. Ideally, 5 – 8 GCP targets should be used for most projects. We recommend achieving a ground sampling distance (GSD) of 0.3 inches or less.

Utilizing check points is recommended to verify the model is a correct and accurate project. Check points should be set at a known distance from one another. Placing check points in a L shape is suggested as a way to confirm both axes of the project are accurate.

Section 5 - Community Outreach and Public Trust

5.1 Building Community Trust

A public safety UAS program should embody the core beliefs and values held by both the department and the community it serves by providing professional service based on values of integrity, respect, compassion, and fairness.

To strengthen the relationships between law enforcement agencies and the communities they protect, departments have recognized the significance of community outreach, transparency, and accountability. This trifecta of engagement not only fosters a greater sense of trust but also ensures that the public remains well-informed about the UAS program. In this age of digital connectivity, many departments have harnessed the power of social media as an effective conduit to share successful Unmanned Aircraft Systems (UAS) integration.

Providing concrete real-world instances of successful Unmanned Aircraft Systems (UAS) integration within a community serves to strengthen public confidence in your operations. Highlighting your real-world use of UAS removes concerns and misconceptions, which bolsters public confidence in your program and enhances your credibility to the public when program changes and enhancements are proposed.

For instance, highlighting situations where UAS have been instrumental in search and rescue missions, disaster response, or significant apprehensions, can resonate with the public. These examples exemplify the positive impact that UAS integration can have on community safety, efficiency, and overall well-being.

Empowering the public with information while fostering trust and understanding showcases the potential of UAS technology and demonstrates a commitment to responsible and accountable operations.

5.2 Community Outreach

A public safety UAS program should adopt a multifaceted approach that prioritizes community outreach. Here are some ideas to consider:

Public Demonstrations and Workshops: Consider organizing events where community members can see drone equipment and learn about drone technology. Workshops can include presentations covering responsible drone use, recreational UAS regulations, and guidelines for commercial UAS operations.

Search and Rescue Simulations: Conduct search and rescue simulations in local parks or public spaces, demonstrating how drones can assist in locating missing persons or providing aid during emergencies.

School Presentations: Partnering with your local school district creates opportunities to provide presentations about drones, their functions, and their role in public safety.

Collaborative Events: Partner with local organizations, businesses, and community centers to co-host events that showcase drone technology's positive impact. This also applies to community fairs, festivals, and gatherings. Setting up a display with UAS educational material, recruiting material, and even a flight simulator can serve as a valuable recruiting tool.

Open Houses: Invite the community to the police department's facility for open houses, where they can see the drone unit's operations, learn about the technology, and ask questions.

Social Media Engagement: Share videos, images, and stories about the drone unit's activities on social media platforms to keep the community informed and engaged.

5.3 Transparency and Accountability

Law Enforcement Agencies can take several steps to ensure transparency and accountability in their Unmanned Aerial Systems (UAS) programs:

Community Engagement and Education: Regularly communicate with the public about the purpose, capabilities, and limitations of the UAS program. Host town hall meetings, workshops, and informational sessions to address concerns, answer questions, and provide insights into how the technology is used.

Policy Development: Develop comprehensive and clear policies that govern UAS usage. Include guidelines on when and how drones can be deployed, data collection and retention practices, and privacy protections.

Stakeholder Involvement: Involve community members, civil liberties advocates, legal experts, and relevant organizations in the development and review of UAS policies. Seek diverse perspectives to ensure policies are well-rounded and accountable.

Data Handling and Protection: Implement robust data security measures to safeguard collected information. Establish strict access controls, data encryption, and regular audits of data handling practices.

Training and Professionalism: Ensure that UAS operators and law enforcement personnel receive thorough training on UAS operations, privacy considerations, and ethical standards. Emphasize the importance of professionalism and responsible use of technology.

Incident Reporting and Accountability: Investigate complaints promptly and thoroughly and communicate outcomes transparently to affected parties.

Continuous Review and Improvement: Regularly assess the effectiveness of UAS policies and practices. Seek feedback from the community, evaluate the impact of the program, and make necessary adjustments to maintain transparency and accountability.

By implementing these measures, law enforcement agencies can foster a culture of openness, responsibility, and trust in their UAS programs, ensuring that the technology is used in ways that uphold both public safety and individual rights. Consider the use of third party audits of your program, or an audit from LEDA to ensure the adherence to these guidelines, which will continue to build community trust and transparency.

5.4 Surveillance

In the interest of community trust, LEDA does not endorse the utilization of Unmanned Aerial Systems (UAS) for indiscriminate monitoring. UAS Operators shall adhere to federal, state and local laws pertaining to search and seizure for law enforcement officers.

By adhering to these principles, law enforcement agencies can establish a balanced approach to utilizing UAS technology, ensuring that it is only employed with appropriate authorization, safeguarding privacy rights, and upholding community confidence in policing practices.

APPENDIX

<u>Glossary:</u> (The terms below may not have been used in the Standards Document, but are terms that will be regularly used in LEDA curriculum and training.)

ADM - Aeronautical Decision Making

Aircraft - The body of the drone.

Aircrew - The personnel assigned to any UAS mission. The Aircrew can be just the RPIC, or a number of people directly involved in the operation of the drone.

Airspace Deconfliction - The act of making sure each aircraft being flown in the nearby airspace is flown at a sufficient distance, both vertically and horizontally, to be deemed safe.

Air Boss - A person who is responsible for mitigating airspace risk around the operation. The Air Boss is tasked with coordinating any airspace deconfliction, especially on approach and departure.

Battery Swap - Changing out depleted batteries for fresh and fully charged batteries.

BVLOS - Beyond Visual Line of Sight. This is a term used to describe when the aircraft if being flown outside of the vision of the pilot or any member of the aircrew or department.

CRM - Crew Resource Management

Counter UAS - This term refers to software and tactics used to detect drones and mitigate their risk, or, at times, potentially bring the subject drone down to the ground safely.

Drone Vehicle - A patrol vehicle that has been converted for the use of drones, commonly containing a pure sine wave inverter for power to charge batteries, a large screen monitor, and a system in place to be able to run protracted UAS missions.

EVLOS - Extended VLOS. This is a term used to describe when the aircraft is flown beyond visual line of sight of the RPIC, but VO's are used in a forward position to be able to aid with geospatial awareness and airspace deconfliction.

Geospatial Awareness - The understanding of the airspace around your drone, both physically with the use of your eyes to see around the drone while in the air, or with the understanding of what is around your drone through memory if operating within a structure and outside of line of sight.

Hot Spot - When a drone operator observes an amount of heat emitting from an object with the use of a thermal payload.

Leapfrog - The act of flying a second aircraft out to the same area as the primary drone that is currently observing a point of interest. The second aircraft will be flown at a safe distance above or below the first aircraft, but take over the point of observation for the first aircraft for the purpose of bringing the primary aircraft in for a battery swap.

Lost Link - When the aircraft no longer has connection with the remote controller while in flight.

Orbit - Flight of the drone in a lateral motion either in clockwise or counterclockwise direction, smoothly keeping the point of interest in the center of the frame.

Overwatch - The use of a drone to provide a point of observation over the target location.

Payload - Anything that is attached to the drone. The payload can be mechanical, and able to be remotely controlled, or could be a complete manual operation using external, non-remote aided methods.

Pilot/Operator - The person manipulating the controls of the drone. This may not be the RPIC every time, but most of the time it will be.

Program - The collective adaptation of the use of drones for the agency's law enforcement function, to include drones, policies, procedures, training, personnel, and equipment to facilitate that agency's use of drones.

UAS - Unmanned Aircraft System, this describes the platform as a whole including the drone, payload and ground control system.

RC - Remote Controller, controls the aircraft and the payload attachment.

RPIC - Remote Pilot in Command, the person in charge of the operation of the drone.

Search and Perch - The insertion of a small drone into the interior of a structure for the purpose of visually searching the location for a subject. Once a subject is located, the drone operator will land the drone (perch) and keep the camera in a position to be able to keep watch of the subject or threat area.

Signal Loss - When the remote controller is no longer receiving a video transmission from the drone.

Spotlight - A light attachment to the drone, whether stationary or gimbal controlled.

Team Debrief - Intentional and directed conversation amongst those team members involved in the UAS operation, held immediately after the conclusion of the operation.

TFO - Tactical Flight Officer. This person operates the camera payload, communicates and coordinates with ground resources and broadcasts radio communications. If there is not the capability to separately operate the camera payload, the TFO can be one who is watching the drone's camera feed and performing the same functions, without independently operating the camera.

TFR - Temporary Flight Restriction. This is a restriction on any manned or unmanned aircraft in a certain area at a given time. TFRs can be requested by police agencies and are implemented by the FAA.

Thermal Camera - A camera payload that has the ability to detect infrared radiation. .

Thermal Drone - A drone with thermal camera payload.

UAS - Unmanned Aircraft System. This is a term that includes not just the aircraft, but the camera payload and remote control, or ground control system used to control the aircraft.

Visible Camera - A camera with a RGB sensor capable of detecting visible light.

Zoom Camera - A camera payload with the capability to produce a clear, most preferably, optical zoom.

Visual Containment - The act of flying a drone over an area and using the camera to visually observe the totality of a certain area. This is not to be mistaken for Physical Containment.

VLOS - Visual Line of Sight. This is a term used to describe the constant ability to see the attitude and orientation of your aircraft while in flight. The FAA allows brief loss of VLOS when traveling around an object or structure, but you must be able to regain VLOS immediately if necessary.

VO - Visual Observer. This person is responsible for keeping an eye on the drone while in flight and the obstacles and hazards around the drone's airspace while having constant contact with the RPIC or Pilot.

Warm Zone - A location where the aircrew operates, but is not completely secure and a tactical team may be necessary to protect the safety of the aircrew. For example, during SWAT operations, it may be necessary to be closer to the target structure for the aircrew to keep signal connection with the aircraft. The aircrew may need to move up to a warm zone with protection from tactical team members, but not enter a hot zone where there is an active threat.