



DRONERESPONDERS
Public Safety Alliance

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**A GUIDE TO IMPLEMENTING A SUCCESSFUL
PUBLIC SAFETY UNMANNED AIRCRAFT SYSTEM/REMOTELY PILOTED AIRCRAFT SYSTEM PROGRAMME**

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The following guidelines/considerations are provided to ensure a safe, legal and effective implementation of a public safety unmanned aircraft system (UAS)/remotely piloted aircraft system (RPAS) programme. For many of the specific areas referenced in this document, information is available within the online DRONERESPONDERS Resource Center found at DRONERESPONDERS.ORG.

General Overview:

Creating a Public UAS/RPAS Programme is a complex undertaking. Based on the experience of successful programs, the following information is provided to assist in starting a UAS/RPAS programme.

1. Know what is involved. Creating a UAS/RPAS programme requires governance, policies and procedures, defined missions, selection of unmanned aircraft and payloads, training/proficiency, data management, maintenance, thorough documentation of training/flights/maintenance and ensuring protection of civil rights and privacy.
2. Understand the cost implications for the UAS/RPAS (aircraft, extra batteries, payload sensors, extra propellers, data storage, software applications, video streaming, training, maintenance, operational and personnel resource costs).
3. Understand the applicable country regulations, laws and emergency exemptions pertaining to public safety UAS/RPAS operations.
4. As a remote pilot, there is a great responsibility as each remote pilot is considered an aviation pilot as they are flying in official airspace and potentially flying among other UAS/RPAS and/or manned aircraft.
5. At all times, the Remote Pilot in Command (RPIC) is the final decision on if/when the UAS/RPAS will or will not be flown based on a risk assessment.
6. Understand the airspace in the respective UAS/RPAS operational area. Areas that include military bases, commercial airports, national parks and other restricted airspace may require additional planning and permissions.
7. Understand that weather is a critical element and it's impact on UAS/RPAS operations and may change rapidly (before and during operations).
8. What mature public UAS/RPAS programs have learned:
 - a. Agencies fly more missions than ever expected
 - b. UAS/RPAS provides enhanced responder safety and critical information for better decisions
 - c. Fly many more types of missions than originally planned
 - d. Are requested to fly for other non public safety missions
 - e. Most agencies start out small with one aircraft to learn to fly
 - f. Needed to purchase additional aircraft and payloads for the missions being flown
 - g. Necessitated the need to train additional remote pilots

- h. Required more training time
 - i. Some departments are reluctant to let their remote pilots leave for extended periods of time as public safety drone programs transition from “nice to have” to “need to have”
 - j. If they had known what they know now, they would have purchased a different UAS/RPAS with different payloads.
 - k. More than one UAS/RPAS is needed.
 - i. To ensure redundancy in the case one is not operational (there is a common saying that 1 UAS/RPAS equals none and two equals one).
 - ii. Some operations are longer and may require multiple aircraft to maintain constant overwatch of an operation due to limited flight time and need to replace batteries.
 - l. Some UAS/RPAS are better suited for specific missions based on
 - 1. Flight time for defined missions
 - 2. Payload/capability requirements
 - 3. Limited area for take-off/landing
 - 4. Ability to look upward
 - 5. Weather (rain, wind, heat, extreme temperatures)
 - 6. Sense and avoid technology that allow flights into confined areas (Skydio2)
 - 7. Electro-magnetic interference
 - 8. Indoor flight
 - 9. Need for zoom capability
 - 10. Dual operator capability
 - 11. Ability to stream video locally and remotely
 - 12. Ability to integrate specific software solutions
9. Today, some popular models of UAS/RPAS provide both visual optics and thermal image capabilities and may show both views side by side or separately.
10. Thermal imaging has unique characteristics, different color palettes and requires additional training to understand the differing heat signatures and utilize effectively.
11. Payloads (Most commonly desired payloads/capabilities):
- a. Hi-Def digital imaging/video
 - b. Thermal imaging camera
 - c. Live streaming video
 - d. Video zoom
 - e. Catch/release mechanism
 - f. Lighting system
 - g. Speaker
12. In addition to the aircraft & payload, there will be additional costs for extra batteries, parts, controllers, tablets, etc. It’s important to know the full costs before starting a UAS/RPAS program as these costs will be ongoing and over time will likely cost more than the aircraft itself.
13. Utilization of software solutions for mapping, 3-D modeling and others require training, planning and data storage.
14. Data storage/retention may have legal requirements. Especially evidentiary for criminal investigations. Know what they are in advance.

UAS/RPAS Implementation Guidelines:

- Address privacy concerns at very beginning by engaging your community’s administration and elected officials from the start. Be transparent, with elected officials, and the public.

- DRONERESPONDERS, in cooperation with Skydio, drafted the Five C's (a law enforcement guide to responsible flight and maintaining public trust). While this is more specific to the U.S., most of the principles are applicable.
- DRONERESPONDERS has a Public Outreach Program (Presentation and Methodology for Town Hall meetings as a Customizable Template) and can be found in the Resource Center on the DRONERESPONDERS.ORG website.
- Obtain and share success stories from other localities (there are plenty), learn from and share them with officials and the public. In the DRONERESPONDERS Spring 2020 Study, over 17 use cases were identified, here is a partial list:
 - Structure fires – overwatch, identify heat signatures
 - Wildfires – overwatch, fuel load assessments, incendiary drops for backfire operations
 - Hazmat – overwatch, identify substances, identify direction of spill, see invisible plumes, gas clouds or flames, determine content levels in containers
 - Law enforcement tactical ops – pre-arrival reconnaissance, overwatch during ops, indoor flights, fleeing suspects
 - Traffic crash reconstruction – reduces road closure time, reduces secondary accidents and enhances responder safety
 - Traffic flow analysis
 - Search for lost persons – access dangerous terrain, cover larger search areas, thermal imaging to locate lost persons
 - Fly into collapsed buildings to search for trapped people and keep searchers out of dangerous areas
 - Damage assessments from major incidents and natural disasters
 - Forensics – fire and crime investigations with 3D modeling
 - Monitor civil unrest – identify violence, looting, vandalism and deconflict with vehicular traffic
 - Suspicious package and possible bomb/explosive device investigations
 - Pre-incident facility planning and 3D modeling
 - Swift water rescues – overwatch, drop flotation devices or ropes
 - Lifeguard Ops – drop flotation device to swimmers in trouble
 - Shore patrols for shark, alligator or crocodile detection
 - Public demonstrations
 - Training – capture training activities for later review and lessons learned
- Define potential missions, plan to use the UAS/RPAS for multiple mission types. Identify mission types from the beginning and learn from other agencies experiences. If your agency is the only one with a public safety UAS/RPAS program in your community/region, your agency will likely be requested to respond to incidents from other disciplines and possibly other communities.
- Talk to departments with existing programmes about their experiences, missions, aircraft/payload/solution purchases, policies, procedures, training, etc.
- Purchase UAS/RPAS or consider a service provider that will be able to meet your defined mission requirements.
- Consider one or two smaller/less expensive UAS/RPAS to learn on and to use in precarious situations where the UAS/RPAS may be contaminated and require disposal.
- Identify & Implement a Fleet Management Program that can log and capture flights, battery usage, training, certifications and basically manage all of your operational data. This will be important to maintain programme continuity, integrity and liability protection.
- Once UAS/RPAS is purchased, identify if the aircraft has programmed geofencing. If so, you can work with the manufacturer to have it removed. DJI will remove the geofencing permanently if a public agency. You can also purchase UAS/RPAS without geofencing.

- Consider creating a multi-agency and/or multi-discipline UAS/RPAS team when possible. This brings agencies together and shares the burden of cost of equipment, training and staffing resources for remote pilots.
- Develop a clear policy as to when UAS/RPAS will be used for law enforcement surveillance and evidentiary purposes (see the Five C's) and share that openly with the community.
- Use search warrants as required.
- Develop policies and standard operating procedures that address these areas and requirements:
 - Governance
 - Operations
 - Risk assessment prior to flight
 - Remote pilot qualifications, job performance and proficiency requirements
 - Training
 - Streaming video
 - Maintenance
 - Flight documentation
 - Airworthiness
 - Data retention/storage
 - Applicable rules, regulations, laws and emergency operational exemptions
- Develop a logistics plan for support of operations
 - Aircraft storage
 - Spare aircraft
 - Safe storage for extra batteries
 - Battery charging strategy
 - Spare propellers
 - Video streaming
 - Transportation
 - On scene deployment plan
 - On scene demobilization plan to ensure data captured, equipment capture and return all aircraft and associated equipment to operational status and returned to its appropriate storage location so its ready for the next mission
- Develop UAS Concept of Operations (CONOPS) – this guide provided in the U.S. by the Center of Naval Analysis with participation of DRONERESPONDERS - <https://www.dropbox.com/s/8whzgiqvy9mlt1d/CNA%20Integrated%20UAS%20CONOPS%20Guide%20and%20Template%20v1.0.pdf?dl=0>
- Develop and explain the training and skills proficiency plan and safety protocols.
 - Consider using the NIST Standard Test Methods for Small Unmanned Aircraft Systems as minimum basic flight requirements and proficiency assessment tool (RobotTestMethods.nist.gov).
- UAS/RPAS is an air operation – if operating at an emergency incident, UAS/RPAS Ops must be incorporated into the Incident Command System (ICS) to ensure airspace deconfliction from other UAS/RPAS and manned aircraft (medical helicopter, wildland firefighting aircraft, news media, etc.).
 - Utilize an air boss/coordinator – designee who manages both unmanned and manned aircraft coordination.
 - Establish air space separation policies for UAS/RPAS and manned aircraft operations.
 - Know that UAS/RPAS may be utilized by other entities and be operating in the area (news media, insurance, utilities, other government agencies)

- If possible, try to establish relationships with other entities with UAS/RPAS in advance of emergencies to plan ahead
- Develop a maintenance plan for aircraft, batteries, controllers, payload sensors and overall UAS/RPAS airworthiness to ensure mission readiness.
- Identify liability issues, risk management planning and implement appropriate insurance as needed/required.
- Utilize Public Safety UAS/RPAS Standards & Information to organize a UAS Program for more specific and detailed guidance:
 - The Five C's (Principles for responsible flight and maintaining public trust - https://96aed291-76e8-4e1e-8460-cb6ce37417a2.filesusr.com/ugd/e60acc_b8b5e91b307f42319ebb92212d051672.pdf)
 - National Fire Protection Association Public Safety UAS Standards - www.nfpa.org/2400
 - ASTM Operational Standards for Small UAS - <https://www.astm.org/standardization-news/?q=update/operations-standards-for-small-unmanned-aircraft-systems-mj14.html>
 - ASTM F38 Subcommittee F38.03 on Personnel Training, Qualification and Certification - <https://www.astm.org/COMMIT/SUBCOMMIT/F3803.htm>
 - ASTM 3379-20 - Standard Guide for Training for Public Safety Remote Pilot of Unmanned Aircraft Systems (UAS) Endorsement - <https://www.astm.org/Standards/F3379.htm>
 - ANSI UAS Standards Collaborative Roadmap - https://www.ansi.org/standards_activities/standards_boards_panels/uassc/overview
 - To join FREE and participate in a nationwide grassroots public safety UAS/RPAS initiative, visit www.DRONERESPONDERS.org
 - **New Document Released by the European Union Safety Agency (EASA) – European Aviation Safety Plan 2021 to 2025** - <https://www.easa.europa.eu/document-library/general-publications/european-plan-aviation-safety-2021-2025>

EXAMPLES OF NEW UAS PROGRAMS

- **Actively Tethered Drone Program** - For agencies not sure they want to develop a full blown UAS/RPAS program, actively tethered drones may be an acceptable alternative to start and evaluate the value. Unlike free flight drones, actively tethered drones:
 - Considered a Tier 1 level stationary operation. Provide continuous flight and overwatch for hours because the tether provides a continuous power source which does not require changing batteries.
 - Can be mounted in a compartment or on the roof of vehicle or in a portable case.
 - Can provide both visual optics and thermal imaging views.
 - Can stream live video to incident commanders and/or others who need access.
 - Is a simple operation of a one button launch and one button land.

Drone as a First Responder (DFR) Program is a program started with the Chula Vista California Police Department where a UAS/RPAS is launched immediately at time of incident dispatch to provide early incident reconnaissance which helps public safety have more information to make better and safer decisions. This requires a BVLOS waiver. DRONERESPONDERS has initiated a DFR Working Group. If interested in participating, send an e-mail to charles@droneresponders.org

Indoor flight for Law Enforcement is becoming an accepted practice to enter dangerous situations, conduct room searches, active shooter, SWAT ops, hostage situations and more. This dramatically reduces danger to officers by keeping them out of harm's way while providing invaluable reconnaissance.

Join **DRONERESPONDERS (it's FREE)** and gain access to the Resource Center which contains over 500 public safety UAS/RPAS documents (SOPS's, training info, checklists, best practices, reports and more). **For additional information: Contact Chief Charles L. Werner (Ret.), Director DRONERESPONDERS Public Safety Alliance at email - Charles@DRONERESPONDERS.org**