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Drone as First Responder:

Practical Insights into Law Enforcement Implementation

This technology brief explores Drone as First Responder (DFR) programs and aims to inform law enforcement practitioners and other stakeholders about potential benefits and considerations for their implementation. This brief defines DFR programs and their typical workflows; highlights key technologies used; provides insights from agencies implementing DFR programs; and discusses technical, operational, and governance considerations.

- The adoption of DFR programs is driven by operational challenges, including staffing shortages and long response times. DFR programs may reduce incident response times; capture video evidence to assist in identifying suspects, victims, witnesses, and physical evidence; reallocate patrol to more urgent incidents; and provide critical incident information to improve response strategies and officer safety.
- The implementation of a DFR program should be grounded in a clear mission or purpose, with defined metrics to assess impact. Success depends on factors such as thoughtful DFR program design, effective technology integration, operational planning, and strong governance practices that prioritize community engagement and adherence with federal, state, and local regulatory frameworks.
- Community engagement and transparency are key toward establishing expectations for the purpose of DFR programs and addressing potential concerns about drone surveillance. Many agencies proactively engage with their communities and other stakeholders, such as advocacy groups, prior to implementing their programs. Additionally, some agencies have created public dashboards to share flight data to promote transparency.
- DFR programs require navigating a complex and rapidly changing regulatory landscape. Agencies need to follow Federal Aviation Administration regulations, including employing certified Part 107 pilots.

Drone as First Responder (DFR) programs are an emerging model in public safety where prepositioned small unmanned aerial systems (sUAS),[a] or drones, are deployed to immediately respond to certain calls for service, providing aerial situational awareness often before officers arrive on scene. Law enforcement agencies are implementing DFR programs as a tool to address operational challenges such as response times and limited staffing. The decreasing cost of drones, improved integration and interoperability with existing agency systems, and increased regulatory flexibility from the Federal Aviation Administration (FAA) has reduced barriers to implementing DFR programs. Although many sources highlight the growth of U.S. DFR programs,[1,2] the exact number of agencies operating a program is currently unknown. An estimated 1,700 agencies use drones in some capacity,[3] but only several dozen[1] have implemented a DFR program. A typical DFR response involves a drone being launched and piloted remotely to the scene of an incident and its live video stream being monitored by trained analysts or teleoperators to support decision-making. The potential benefits of DFR include faster response times to calls for service, enhanced situational awareness for in-progress incidents, optimized resource allocations, and enhanced safety for both officers and community members. Although DFR offers potential benefits, civil liberties organizations have raised concerns about data security, privacy, and potential misuse, along with apprehensions about expanded police surveillance. DFR programs may not be the most appropriate match for some agencies looking to implement or expand their use of drones, depending on their capabilities, goals, and budget. Agencies adopting DFR programs should carefully consider these issues when developing appropriate policies and procedures and should engage the community throughout the planning and implementation process.

The products referenced in this report are included solely for illustrative purposes. Their inclusion does not represent a comprehensive survey of all commercially available solutions, nor does it constitute a recommendation, endorsement, or validation of any product or its claims by the U.S. Department of Justice, the National Institute of Justice, RTI International, or the Criminal Justice Technology Testing and Evaluation Center.

a. sUAS are defined as drones weighing less than 55 pounds at takeoff or maximum gross operating weight.

Context

What Is a DFR Program?

A DFR program is a centralized system in which drones are strategically prepositioned throughout a community and launched remotely from a command center or real-time crime center (RTCC) in response to active calls for service. These drones are controlled and monitored by specialized operators,[b] providing real-time situational awareness, often before officers arrive on the scene.

DFR Programs vs. Other Drone Programs

Distinguishing DFR programs from other law enforcement drone programs is important, as they serve different operational purposes and are deployed in distinct ways. DFR programs function as centralized response units, and drones are prepositioned and launched remotely in response to active calls for service. DFR programs are often part of a broader agency drone program, which may also include tactical drone response by first responders (often called patrol-led or field-operated). Unlike DFR, patrol-led programs are operated directly by officers in the field for specific operational needs, such as search and rescue, tactical operations, or crime scene documentation (see Figure 1). These field-operated drones are typically carried in patrol vehicles or deployed by special response units (e.g., SWAT).

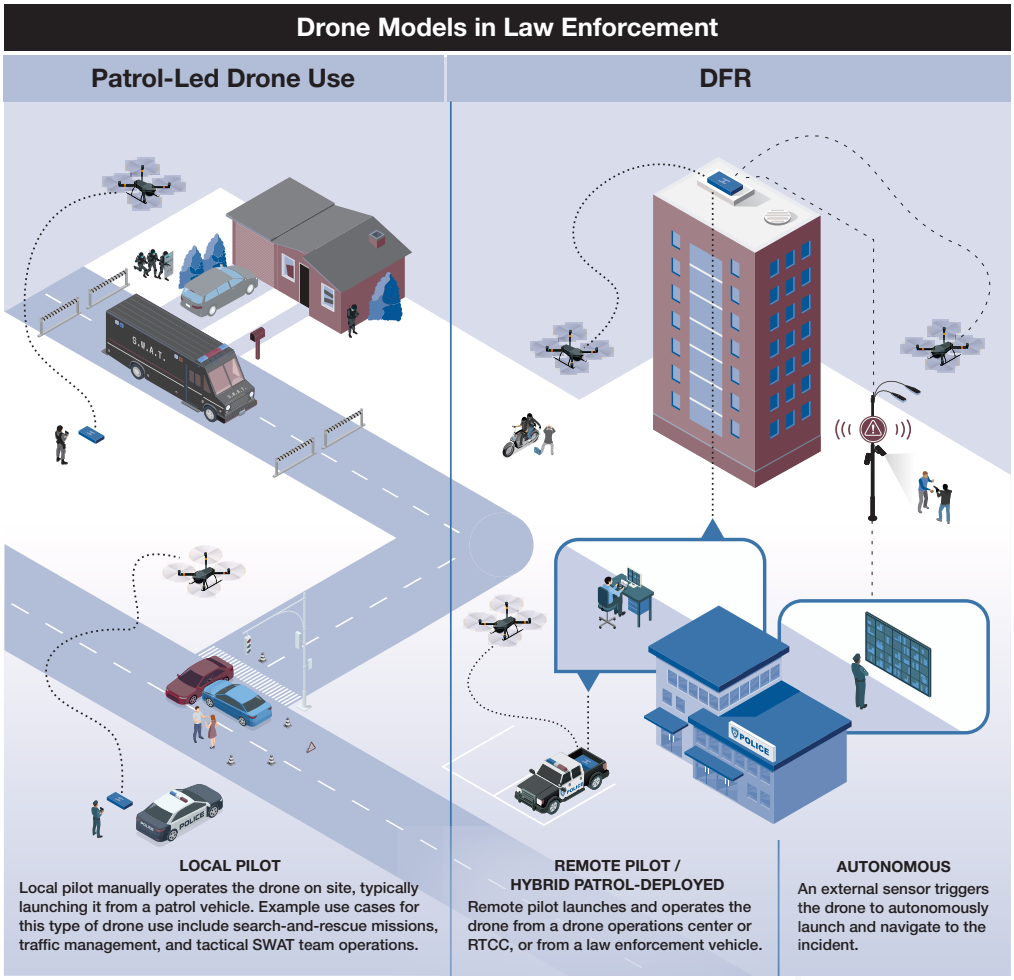

Figure 1: DFR programs serve a different purpose and are deployed differently from law enforcement's traditional use of drones for tactical response.

b. The next evolution of DFR programs involves autonomous deployment, wherein drones are dispatched automatically without the need for human involvement. Some agencies and vendors consider patrol-deployed drones—drones deployed adjacent to an officer's cruiser but remotely operated by a DFR center—as DFR, but this brief will focus on those with prepositioned sites.

What Has Driven Adoption of DFR Programs?

In recent years, the adoption of DFR programs has grown,[1] although the exact numbers vary depending on the source and definition used. One major driver of this growth is agency and public demand for solutions that improve response times, a challenge experienced across agency sizes and geographies. For example, in New Orleans, average police response times nearly tripled from 51 minutes in 2019 to 146 minutes in 2023; in New York City, response times increased from 18 minutes to 33 minutes over the same period.[4] These delays are largely attributed to the decline in police staffing, which has made it more difficult for agencies to dispatch officers quickly to all calls for service. According to a recent survey[5] of roughly 180 agencies by the Police Executive Research Forum, the total number of sworn officers has decreased by about 5% over the last few years,[c] indicating that agencies struggle with hiring to keep up with officer attrition. Advancing drone hardware and software technology has offered significant advancements in performance, usability, and documentation; drone companies have also developed products and guidance specifically for public safety DFR programs, further driving adoption. In response to these challenges, DFR programs can serve as a force multiplier, enabling agencies to maximize their resources. The increasing availability and affordability of drone technology has further contributed to the expansion of DFR programs nationwide.

What Benefits Does a DFR Program Offer?

DFR programs may benefit agencies in the following areas:

- **Improving response times:** DFR programs deploy drones in response to calls for service, often arriving before officers to provide live video feeds and critical situational data. For example, Brookhaven (Georgia) Police Department's DFR program had over 1,700 calls for service in 2024, with drones first on scene for 72% of those calls and an average response time of 70 seconds.[6] Brookhaven noted that drone support provided faster response times and more-effective responses to calls for service than traditional air support mechanisms, which require significant coordination, cost, and lead times.

- **Enhancing situational awareness:** Real-time video streaming allows dispatchers, command staff, and responding officers to assess incidents remotely, improving decision-making and planning. By providing an overhead video feed of the incident, law enforcement can better understand the most appropriate responses and resources needed.

- **Increasing officer and community safety:** Drones can help identify potential threats, allowing officers to approach situations with greater awareness and reducing the risk of escalation. This information can help fine-tune an appropriate response; for example, drone response can help identify whether an individual reported as possessing a firearm is actually holding a cell phone or a lighter. Real-time access to this information may help de-escalate scenarios and reduce incidence of violence, which may have positive impacts on officer physical and mental health.

- **Optimizing resource allocation:** By providing aerial intelligence, DFR programs can help determine how many officers are needed to respond to an incident, potentially helping to free up officers for higher-priority incidents. Arlington (Texas) Police Department noted instances wherein DFR response can clear a call before law enforcement arrival, freeing up officers' time to respond to other calls.

- **Supporting investigations and evidence collection:** DFR programs can leverage drones to document crime scenes, track fleeing suspects, locate witnesses and evidence, and capture video footage that may be used to support investigations and court cases.

- **Supporting officer recruiting and retention:** Agencies noted that a DFR program was a selling point for recruiting talent, as this program demonstrates an agency's priority to adopt new technology, extend law enforcement capacity, and consider officer safety and well-being.

c. Within the roughly 180 agencies surveyed in the Police Executive Research Forum study, staffing numbers dropped from 83,497 in January 2020 to 79,464 in January 2023.

- **Enhancing public confidence and transparency:** The use of drones for real-time response and documentation can build trust with the community by lowering emergency response times. Presence of a DFR program may deter criminals from committing crimes in the areas covered in the program.
- **Enabling specialty response capabilities:** Drone payloads help law enforcement respond to calls for service effectively. For example, speakers and lights may help deter a crime in progress, sensors such as infrared cameras may help locate individuals, and Narcan or automated external defibrillator (AED) payloads can provide necessary supplies when response time is critical.

DFR Workflow

A DFR program follows a structured workflow that ensures efficient and safe deployment of drones to support calls for service. Although the workflow may vary by agency, a typical workflow consists of five key stages: Triage, Deploy, Monitor and Inform, Return, and Document (see **Figure 2**).

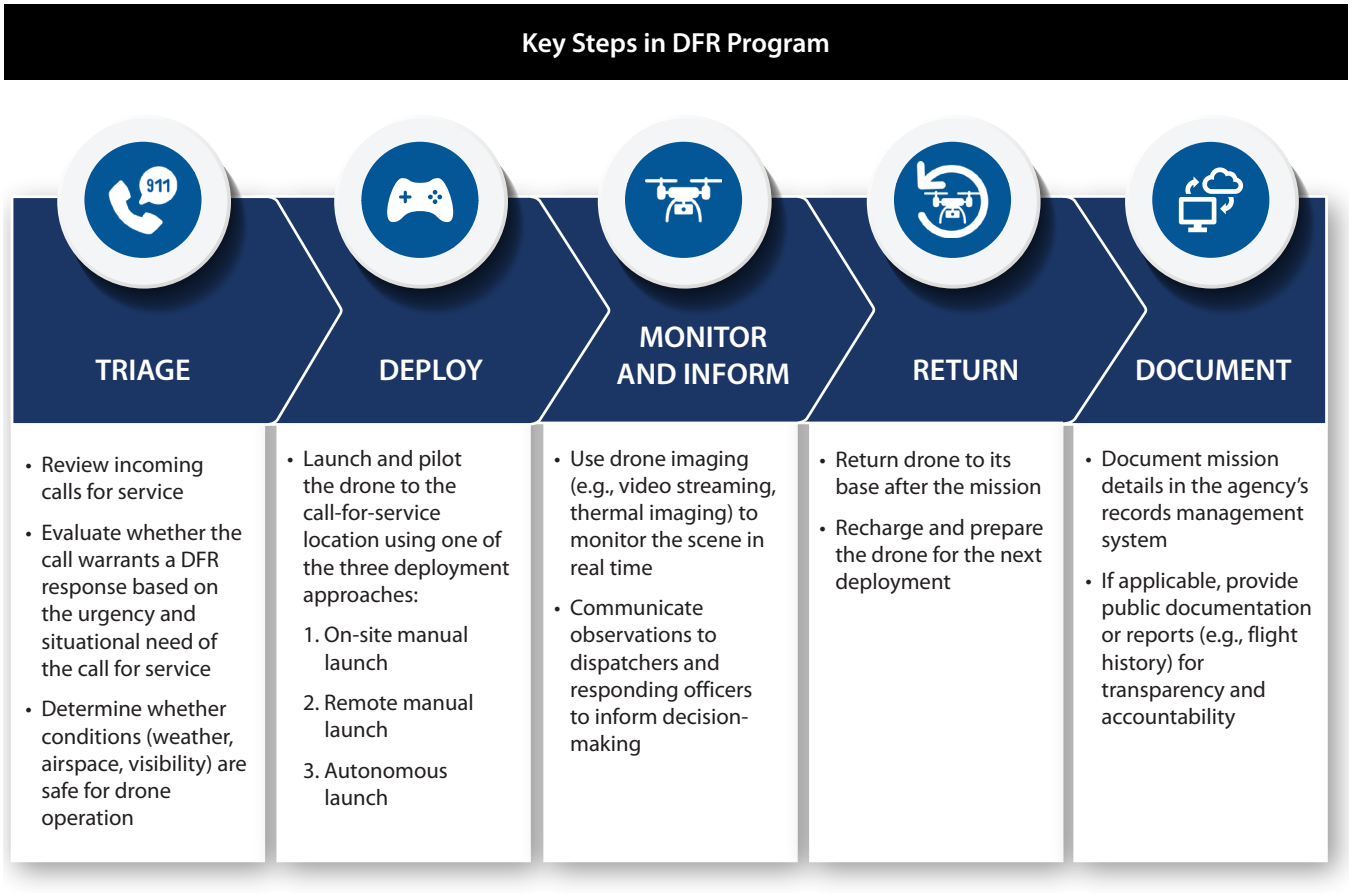

Figure 2: High-level workflow of a response sequence within a DFR program.

Triage

At the front-end of the DFR process, agencies review incoming calls for service and identify calls that may be "right and ready" for drone deployment. In most agencies, this information flows from a computer-aided dispatch (CAD) system, but some agencies leverage real-time 911 information through software such as HigherGround's Live911 system. In most DFR programs, an individual or group of individuals monitor 911 communications and decide whether to deploy the drone. These decision-makers may be integrated into a specific DFR center, an RTCC (which integrates disparate real-time data sources for actionable intelligence), or even a 911 center. Drone go/no-go response depends on a number of factors, including the following:

Live 911™

Live911 is a technology that streams active 911 calls and locations of calls directly to officers. By hearing the call directly, officers can gain a more immediate and nuanced understanding of the situation, including the caller's tone, urgency, and other details. With more information, officers can make better-informed decisions on how to approach an incident. Additionally, the ability to quickly know the caller's location allows officers to streamline response times and for agencies to deploy drones to scenes more efficiently.

- **Weather conditions:** Temperature, visibility, wind, and precipitation conditions must be appropriate for drone flights.
- **Type of call:** The types of calls for service that are appropriate for DFR response vary by agency policy (as do the payload/capabilities of the drone) and could include a wide range of crimes, such as high-priority calls (e.g., armed robbery) or nonviolent crimes wherein additional perspective is necessary (e.g., shoplifting, criminal trespass).
- **Geolocation:** The call for service must be operating in a radius that is accessible to drone deployment. Live911, for example, offers the capability of filtering calls within a specific geofence to the DFR staff.
- **Circumstance:** When multiple qualifying calls for service come in, DFR staff must quickly prioritize (triage) and route drones to calls that may gain the most value from drone response. This prioritization may include rerouting a drone in-flight if a higher-priority call comes in.

Agency Insight

Brookhaven Police Department integrates a deliberate, criteria-based process for drone deployment.

Captain Abrem Ayana, Innovation, Technology, and Special Projects

Jurisdiction Size: ~60,000 (population), 12.23 square miles
Number of Sworn Officers: 93 full-time; 7 part-time

Brookhaven (Georgia) Police Department has established a clear and structured process for drone deployment to ensure effective use of its DFR program. When a 911 call is received, the communications operator listens to the live call using the Live911 platform. Based on the nature of the incident, the operator conducts a mental checklist to assess whether drone deployment can add value to the response. This checklist includes considerations such as line of sight of the drone, type of call, safety of responding officers, and the ability to gain situational awareness before officers arrive.

If the operator determines that a drone would be useful, they request a drone deployment from a rooftop pilot stationed at one of the agency's two drone launch sites. Once authorized, the pilot launches the drone to the scene, often arriving within 70 seconds. The drone's live video feed is streamed directly to supervisors and responding officers, enabling informed decision-making in real time.

The process is designed to support faster, safer, and more-informed responses, with many incidents resolved or de-escalated before officers arrive. By building drone integration directly into its dispatch workflow, Brookhaven has normalized drone use as a routine and trusted part of its emergency response system.

Deploy

When DFR staff deploy drones from fixed locations, they can be flown using a number of approaches, including the following:

1. **On-Site Manual Launch:** A pilot stationed at a fixed location physically launches and operates the drone to the incident.
2. **Remote Manual Launch:** A pilot located at a remote DFR center launches and manually controls the drone.
3. **Autonomous Launch:** The drone is automatically launched and flies to the active incident (usually triggered through an external sensor like gunshot detection) with minimal human intervention.

Agency Insight

Miami Beach Police Department leverages and expands autonomous flight capabilities in its DFR program.

Sgt. Anthony Loperfido, Technical Operations Unit and UAS Program Coordinator, and Lt. Raymond Diaz

Jurisdiction Size: ~90,000 (population), 7.1 square miles land, 10 square miles of water
Number of Sworn Officers: ~400, as of 2023

Miami Beach (Florida) Police Department (MBPD) is actively pursuing autonomous drone operations within its DFR program. Using the Skydio X10 platform and Skydio Dock, the agency deploys drones both manually and autonomously based on the nature of the call and operational urgency. Although most flights are still manually flown due to the compact urban geography and close coordination with officers, autonomous deployments are used in specific scenarios where speed and precision are critical.

One key use case involves officer-initiated requests for backup during traffic stops. MBPD is currently piloting a feature where an officer's Axon body-worn camera broadcasts GPS data that can be detected by Skydio's DFR Command software, enabling a drone to launch autonomously, navigate to the officer's location, and begin providing real-time aerial support without requiring manual flight input. These autonomous launches increase responsiveness and reduce the burden on analysts, especially during fast-moving incidents.

MBPD holds an FAA-issued beyond visual line of sight (BVLOS) waiver, allowing autonomous flights to operate throughout the city's Class G airspace. The department's operational ceiling is 150 feet and within 50 feet of structures, giving drones the flexibility to operate within Miami Beach's narrow streets and high-density environments.

Monitor and Inform

Once at the incident, the drone can enhance situational awareness. Livestreamed video and audio can bring law enforcement safely and effectively into the situation, even before they respond on-site. Some drones used in DFR programs have speakers for one-way communication, whereas others are developing two-way communication (although the drone would need to land or hover low enough for the speaker to be audible). Thermal-imaging cameras and the ability to hand off emergency equipment like Narcan and AEDs can enhance law enforcement's ability to address an emergency.

Return

When the call has been cleared or if a battery swap is needed, the drone will return to the deployment location to await future deployment in the next response cycle. The drone can be manually or autonomously recalled to its launch site. Agencies often assess the drone's airworthiness prior to the next flight. Agency staff may visually assess the drone for potential damage or quality issues or use camera feeds and sensors on dock-deployed drones to identify potential issues that may impact future deployments

Document

Documentation of the DFR mission is valuable to ensuring community awareness, preserving integrity of evidence, and improving the quality of the program. For community transparency and useful data analytics, many agencies publish flight history on their website. For example, Brookhaven's flight history dashboard includes a map of the flight path, the address of the incident, and a summary of the incident.[7] Many DFR software providers, such as Motorola's CAPES system, enable easy tracking of data such as flight paths, calls for service, and associated metadata. Video and audio feed and associated metadata of the DFR mission are recorded and documented by drone providers, and these data can be uploaded to digital evidence management systems.

Designing a DFR Program

Although DFR programs share common goals, they may look different across agencies based on agency policies, resources, risk appetite, and current technology infrastructure. Program design may look different based on department goals, surrounding airspace, drone launch site selection, and crime or call-for-service situation.

Determining DFR Program Vision

Before launching a DFR program, agencies should align on a vision for what an effective DFR program looks like for their jurisdiction. This vision helps define the size and scale of the program and should be informed by agency realities, such as budget, technical capabilities, staffing constraints, and airspace limitations. Key questions to guide this process include the following:

- **What are the agency's goals and value drivers for DFR?** Agencies should identify the primary challenges that DFR is intended to address:
  - **Staffing shortages:** Agencies may value DFR's ability to clear calls before officer arrival, freeing personnel for other priority calls.
  - **Improving response times:** Agencies aiming for faster response times may need to invest in technologies like Live911 or autonomous flight capability (with the necessary FAA approvals and waivers) to streamline feedback loops and deploy drones more quickly.
  - **Specialty response capabilities:** Agencies interested in additional imaging capabilities (e.g., thermal imaging), speakers for one- or two-way communication, or payloads like Narcan need to evaluate what types of drones support these functions.
- **What does success look like, and how will it be measured?** Agencies should establish clear success metrics for their program and implement policies to collect, measure, and create records of the data at the launch of the DFR program. Agencies should determine the following:
  - **What metrics to track:** Examples include response time to calls for service, number of calls cleared by arrest or calls cleared with no further action needed, instances of de-escalation, the number of officers diverted to other calls, changes in officer-involved shootings, and use of force with and without DFR assistance.
  - **How to track them:** Agencies need to determine how they will track their defined metrics. For example, agencies may need to configure additional fields in their CAD system, records management system (RMS), or flight management system to track these metrics. Agencies may consider integrating flight management systems with their CAD/RMS systems to streamline data aggregation and management across missions.

- **What types of calls will DFR support?** Agencies need to define the scope of their DFR programs:
  - How and when DFR will be used
  - Roles and responsibilities of relevant staff
  - Call types prioritized for drone response
  - Policies for guiding decision-making on drone deployment
  - Methods for documenting and communicating these decisions internally and externally
- **What are the physical characteristics of the area of DFR operation?** Local geography will impact DFR implementation. Agencies need to consider the following:
  - **Area of operation:** The size of the area of operation will guide decisions around drone specification and launch site selection.
  - **Environment:** Urban density, tree cover, and tall structures can affect flight paths.
  - **Climate and weather:** Weather can influence drone operability. For example, extreme temperatures can reduce battery performance and affect visual observer time on rooftops. Wind and precipitation can limit flight opportunities or require weather-resistant equipment.
- **How will the agency phase in the technology?** Some agencies started their DFR programs by piloting a single launch site or testing multiple vendor systems before deploying a full-scale DFR program. Pilot efforts can help agencies optimize systems based on existing technologies and operational constraints.

Once a shared vision is established, agencies can begin operational planning. Operational planning includes pursuing relevant FAA certifications, evaluating airspace restrictions, and selecting launch sites for prepositioned drones to maximize coverage and response times.

Navigating Drone Use Regulations

FAA regulations governing DFR programs are part of a dynamic and continually evolving framework shaped by advancements in drone technology and the expanding role of drones in public safety operations. Accordingly, the FAA continually updates its policies to balance innovation with airspace safety and maintains a comprehensive UAS website that provides regulatory requirements, operational guidelines, and resources tailored for public, commercial, and government drone operators.

At the federal level, the FAA sets the rules for when, where, and how drones may operate, and public safety agencies must adhere to these requirements. Most law enforcement DFR operations are conducted under two primary regulatory pathways: FAA Part 107, which governs drones used for commercial and government purposes, and a public safety–specific Certificate of Waiver (COW), previously referred to as a Certificate of Authorization (COA). These frameworks provide different levels of flexibility and operational scope, with waivers or authorizations[d] required for activities that fall outside the standard provisions, such as operations over people or at night, or flights that are beyond visual line of sight (BVLOS).

d. To stay up to date on regulatory requirements, operational guidelines, and resources, consult the FAA website: https://www.faa.gov/uas

Part 107 Regulation

Under Part 107, public safety agencies may operate drones weighing less than 55 pounds, provided the remote pilot holds a valid Remote Pilot Certificate.[8] Part 107 serves as the foundational regulatory framework for both commercial and governmental drone operations in U.S. airspace and is the most commonly used entry point for public safety agencies beginning drone programs.[9] Although Part 107 regulates for a range of basic operations, it also includes several default restrictions that limit the ability to use drones effectively in emergency response scenarios, such as BVLOS operations and flights over people and moving vehicles. Thus, to fully realize the capabilities of DFR programs, agencies must satisfy a range of operational requirements and obtain specific approvals and waivers from the FAA that authorize advanced flight operations to ensure that drones can be deployed purposefully and effectively in emergency response scenarios.[10]

Certificate of Waiver

To effectively operate a DFR program, agencies can apply for and receive waivers to specific Part 107 regulations, such as flights over people and moving vehicles. The Part 91 BVLOS waiver is a specialized FAA-issued COW granted under 14 CFR 91.113(b),[11] which allows eligible public safety agencies to operate drones BVLOS of the pilot. This authority exceeds the limitations of standard Part 107 rules and permits longer-range drone flights that can be launched remotely, often from rooftop docking stations located at designated facilities.[9,12]

In April 2025, the FAA introduced a streamlined process for obtaining Part 91 BVLOS waivers, reducing the time required for review and approval. Under the revised framework, most applications are approved within 1 week; the previous system often took several months and required agencies to apply up to 90 days in advance.[13] This faster timeline enables public safety agencies to more effectively implement DFR programs and adapt their operations to real-time needs. Once granted, the waiver provides greater flexibility by allowing agencies to expand their drone programs, retire outdated waivers, and consolidate multiple authorizations under a single Part 91 approval. This approach improves program efficiency; reduces administrative workload; and promotes consistency in training, compliance, and oversight.[14,15]

Understanding the National Airspace

As FAA regulations continue to evolve, particularly regarding BVLOS operations, maintaining strong and ongoing coordination with the FAA remains essential to the success of any DFR effort. Agencies must fully understand and navigate the airspace in which their drones will operate. In the United States, the FAA categorizes the national airspace into multiple classes (A through G), each with specific operating rules and varying levels of air traffic control involvement.

Most DFR operations occur at low altitudes, typically less than 400 feet above ground level. At these altitudes, Class G airspace (uncontrolled) and Class D and E airspace (controlled) are the most relevant. Launching and flying within Class G airspace is the least restrictive, allowing drone operations without air traffic control coordination if aircraft remain less than 400 feet above ground level. In contrast, Class D, Class C, and Class B airspace are commonly found around towered airports, urban centers, and major commercial flight routes, respectively. Operating in these areas requires FAA authorization. Agencies must secure approvals such as COWs and Part 107 airspace authorizations or, in some cases, formal agreements with local control towers.

In addition to these permanent classifications, departments must also account for special use airspace and temporary flight restrictions (TFRs). Special use airspaces include prohibited areas, such as those surrounding military installations and restricted areas that may host sensitive government operations or military training. These zones are typically off-limits to drones or require prior FAA coordination. For example, law enforcement agencies operating near the Washington, DC, metropolitan area must comply with the Flight Restricted Zone, which imposes strict limitations on all drone flights.

TFRs create additional considerations. The restrictions are issued on a short-term basis in response to specific situations, such as VIP (e.g., the U.S. President) travel, emergency response zones, or large public gatherings like parades or sporting events. TFRs prohibit all unauthorized aircraft, including drones, from entering the designated area and altitude range during the period of restriction. Therefore, agencies must routinely check FAA-issued Notices to Air Missions and ensure that launch site selection and flight planning avoid both permanent and temporary airspace conflicts.

Ultimately, to successfully implement a DFR program, agencies should engage with the FAA early in the process, ensure all pilots are properly certified, and develop robust safety and risk mitigation protocols aligned with the FAA's Safety Management System for drones.[16]

Selecting Drone Launch Sites

The strategic selection of launch sites is critical to a DFR program's success. Although agencies may align deployments with high-priority response zones or crime hotspots, they must also account for technical, environmental, and regulatory challenges when selecting and maintaining launch sites.

Many agencies use data-driven analyses, such as call-for-service heat maps and historical crime patterns, to determine optimal drone launch sites. These sites are often positioned on existing infrastructure such as police station rooftops, fire stations, or commercial buildings that offer a high vantage point, minimal obstructions, and secure access. Elevated positions improve line of sight and radio signal strength while maximizing geographic coverage and flight path efficiency. Placing launch sites on existing infrastructure also reduces cost and accelerates implementation.

DFR Implementation Support

Agencies may be able to lean on support from vendors in the launch site selection process. For example, Skydio helps agencies strategically place launch sites based on historical calls-for-service data and can help assess viable sites and number of drone sites needed based on agency objectives (e.g., considering the maximum response time allowed, considering whether to account for multiple calls at the same time).

Effective launch site selection involves more than just location. Agencies must consider drone range, battery capacity, weather durability, and communication reliability. When operating under visual line of sight (VLOS) regulations, the drone must remain visible to the remote pilot or a designated visual observer. This regulation typically limits coverage to a radius of 1–1.5 miles from the launch site. To expand operational coverage, agencies can apply for FAA waivers that permit BVLOS operations. BVLOS authorizations may allow drones to operate within a 3-mile radius or more, depending on airspace conditions and risk mitigations aligned with the FAA's Safety Management System framework.

Technical infrastructure at each launch site must support sustained operations, including shelter or enclosures for the drone, power sources for charging and supporting control equipment, and a stable internet or network connection for data transmission and command-and-control links. In VLOS operations, the launch site should also accommodate space and access for a visual observer. Environmental factors play a key role as well. Urban areas often present challenges such as radio frequency interference from dense wireless networks, which can degrade communication between the drone and its controller. Real-time weather monitoring systems should be available to assess wind, precipitation, and temperature conditions that may affect flight safety and performance.

By carefully selecting and equipping launch sites and by understanding both the limitations and capabilities of drone systems and regulatory frameworks, agencies can improve response times and situational awareness in critical incidents. A well-planned DFR launch site network is foundational to achieving rapid, reliable, and safe drone deployments that augment traditional law enforcement response efforts.

Agency Insight

Brookhaven Police Department leverages geo-analytics to drive strategic decisions around DFR program launch site selection, ensuring the program is both efficient and operationally targeted.

Captain Abrem Ayana, Innovation, Technology, and Special Projects

Jurisdiction Size: Roughly 60,000 (population), 12.23 square miles
Number of Sworn Officers: 93 full-time; 7 part-time

Early in program development, the department created heat maps based on both citizen-initiated and officer-initiated calls for service. According to Cpt. Abrem Ayana, this analysis revealed a key operational insight: "The areas with the most citizen calls matched the areas where officers initiated the most activity," underscoring the need for proactive policing in those locations and demonstrating the value of community-informed policing.

These findings directly influenced the placement of Brookhaven's two drone launch sites, which now provide aerial coverage to roughly half of the city's 12- to 13-square-mile jurisdiction. Rather than defaulting to central or convenient locations, Brookhaven selected deployment zones based on real-world data that pinpointed where the greatest volume and variety of calls occurred. The result is a deployment footprint that prioritizes impact, supports faster drone response times, and ensures that coverage aligns with actual service demand.

The department's use of heat maps exemplifies a commitment to evidence-based decision-making, using historical and real-time data to guide infrastructure placement and justify the program's value to leadership, stakeholders, and the community. As Cpt. Ayana described, the department continues to use these analytics to inform expansion and operational refinement, ensuring that they are "putting drones where [they] need them, not just where it's easy."

Agency Insight

Asheville Police Department integrates public–private docking partnerships and disaster-response capabilities into its DFR program.

Captain Brandon Moore, Patrol Commander and DFR Program Lead

Jurisdiction Size: ~94,000 (population); 45.6 square miles
Number of Sworn Officers: 177

The Asheville (North Carolina) Police Department (APD) has a highly adaptable DFR program that integrates a diverse fleet of drones and docking stations, with a strategically positioned public–private docking station network. The fleet spans everything from various Da Jiang Innovations (DJI) models (e.g., Minis, Matrice 30s, Matrice 350s) to heavy-lift drones (e.g., Flycart 30), as well as tethered Fotokite systems, and multiple DJI Dock configurations. Among them is a rear-mounted DJI Dock 2 system installed on a Ford-150 Lightning pickup truck, allowing officers to respond to calls for service by launching drones directly from the field while being piloted remotely from a command center. This fleet ensures APD can align the right tool with the right mission, whether that's rapid response to incidents, specialized disaster support, or transport and delivery of heavy equipment.

A key enabler of this program is APD's partnership with OvrWatch. Rather than relying solely on city-owned sites, OvrWatch works with private businesses such as department stores that are willing to host drone docking stations on their rooftops. In return, these businesses gain enhanced security benefits and access to aerial data, and APD gains strategically positioned launch points across the city. This public–private approach has allowed the department to quickly build a dense and resilient docking station network without shouldering the full infrastructure cost.

By blending city-owned assets with launch sites hosted by private businesses, APD has expanded its operational footprint and cut response times. Today, drones can reach 62% of calls for service in Asheville's downtown zone within 2 minutes, and APD's expanded dock network is further reducing response times throughout the jurisdiction. FAA waivers authorizing 400-foot operations in the downtown core and 200-foot mixed-height operations citywide further enhance APD's ability to conduct both routine incident response and BVLOS missions.

By minimizing reliance on municipal funding and spreading infrastructure costs through partnerships, APD has created a cost-efficient, scalable framework that other budget-constrained agencies can replicate. The benefits of this approach became especially clear during Hurricane Helene, when the public–private docking network allowed for rapid drone deployments that supported search-and-rescue operations, assessed infrastructure damage, and helped the city recover faster.

Technology Required for Implementing a DFR Program

Agencies planning to implement a DFR program must choose from a variety of hardware and software options, each with different levels of technical capability. This is especially important for agencies aiming to incorporate advanced operations, such as BVLOS operations and autonomous drone deployment.

A minimum viable DFR setup—defined as the most basic setup that still enables a successful DFR program—typically includes a drone equipped with a high-resolution camera capable of livestreaming audio and video, along with a flight management system (as shown in **Figure 3**). This setup usually requires an operator with visual line of sight of drone operations or the use of visual observers. To enhance and expand DFR capabilities, agencies can leverage different advanced hardware and software features.

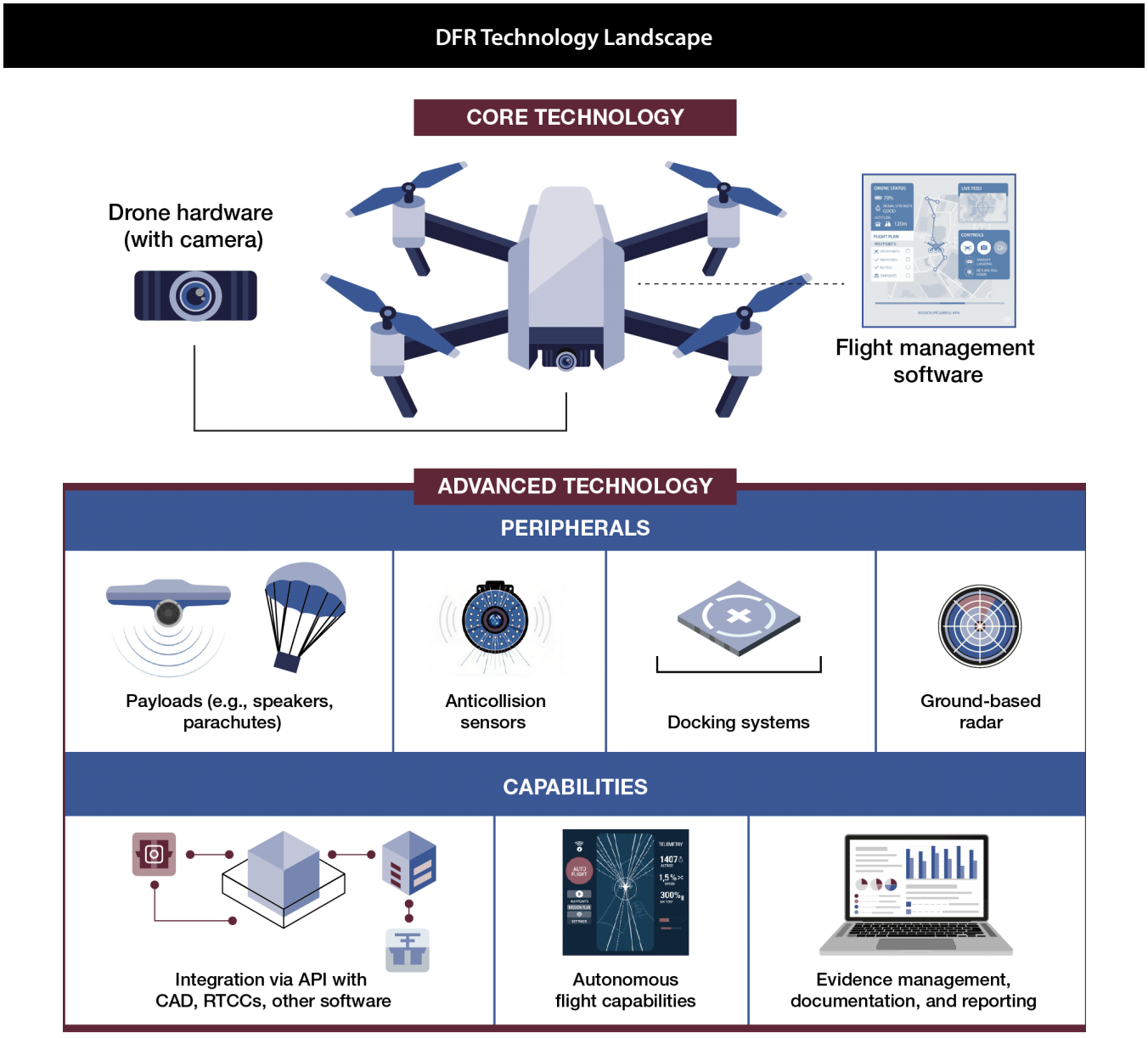

Figure 3: Core and advanced drone hardware, software, and peripherals used in a DFR program.

Hardware

Drone Technology

Agencies can choose from several manufacturers that have demonstrated a high level of performance in prior DFR programs, including models from DJI, Skydio, and BRINC. These drones can incorporate several types of payloads beyond high-resolution cameras, such as onboard police lights, night-vision cameras, thermal-imaging sensors, speakers, microphones, and emergency equipment. When purchasing drones, agencies should consider purchasing multiple swappable batteries to maximize operational time.

Drone Technology – Vendor Spotlight

DJI	Skydio	BRINC
DJI drones, manufactured in China, are widely used in DFR programs because they offer high value for their cost. Among DJI's offerings, the Matrice 350 RTK is popular for DFR operations because of its advertised flight time of up to 55 minutes. It is often paired with the DJI Zenmuse H20T, a multi-sensor payload that combines a 20MP zoom camera, a 12MP wide-angle camera, and a thermal camera (640×512 pixels).	The Skydio X10, manufactured in the United States, is built specifically for public safety and defense applications. It is increasingly used in DFR programs because of its autonomous flight capabilities and compliance with recent legislation enacted in some states. The Skydio X10 has an advertised flight time of up to 40 minutes and is often paired with one of the Skydio sensor packages, such as the VT300-L, which includes a 64MP narrow camera, 50MP wide-angle camera, and a radiometric thermal camera.	BRINC's Responder, manufactured in the United States, is designed specifically for DFR programs and has an advertised flight time of up to 42 minutes. The Responder is equipped with a multi-sensor payload that includes a full HD camera with 60-degree field of view and 42x total zoom, a thermal-imaging sensor, and an onboard two-way communication system. Additionally, the Responder offers mountable attachments, including a parachute for enhanced safety of the drone during automated deployments; a payload dropper that allows agencies to deploy AEDs, Narcan, EpiPens, or other lifesaving payloads; and a spotlight to improve visibility during low-light missions.

Developers are looking to outfit the next generation of drones with features that satisfy recent FAA requirements to fly BVLOS or over populated areas at roughly 200 feet. For example, BRINC drones will soon be outfitted with automatic dependent surveillance-broadcast (ADS-B) airspace awareness sensors and incorporate an onboard parachute.

Concerns of Use of DJI Drones for Law Enforcement Agencies

The use of DJI drones by law enforcement agencies has raised growing concerns over national security and data privacy. These concerns center on DJI's connections to China, which generate fears that drone-collected data could be transmitted to Chinese servers or accessed by the Chinese government. In response, the U.S. federal government enacted the American Security Drone Act[17] to restrict the use of DJI drones by federal agencies. Furthermore, law enforcement agencies seeking federal funding are prohibited from purchasing Chinese-manufactured drones, such as DJI drones, and must instead select from the federally developed Blue UAS Cleared List, which includes drones approved as compliant, cyber-secure, and authorized for government use. Several states, including Florida, Arkansas, Mississippi, and Tennessee, have followed suit by banning DJI drones for public safety use, citing cybersecurity risks and a broader goal of reducing reliance on foreign-manufactured technology.

Despite these restrictions, DJI drones remain widely used in law enforcement due to their advanced capabilities, reliability, and cost-effectiveness. These features have made DJI the leading supplier in both consumer and public safety drone markets, especially for agencies facing tight budgets and high operational demands. Although security concerns persist, the strong performance-to-cost ratio has made DJI platforms difficult to replace. Notably, recent legislation aimed at banning DJI drones in Texas failed to advance past the House Calendars Committee, highlighting the tension between security policy and public safety operational needs.

Software

Agencies rely on associated drone flight management software to remotely pilot the drone and transmit live audio and video feeds to the DFR team. Beyond remote piloting, flight management systems allow users to switch or take over piloting responsibilities when needed, track all deployed drones, and make decisions before or during the DFR mission (e.g., regarding airworthiness, flight conditions, and battery life). Although most drone providers (e.g., BRINC, Skydio, Paladin, Aerodome) offer companion software to manage drone deployments, companies serving as system integrators, such as Flock Safety and Axon, leverage third-party drones and operate them through their own management software. These software programs may offer the following advanced features:

- **Integration with RTCCs and CAD:** Flock Safety developed an Aerodome Flight Operations module on its FlockOS real-time policing platform to enable seamless connection and easy drone deployment in response to calls for service. Many software products, including BRINC's LiveOps platform, can interface via API to CAD software and Live911, enabling users to make decisions, deploy, and monitor drones in one centralized location.
- **Autonomous Flight Capabilities:** With a docking station and appropriate FAA waivers, agencies can use this software to autonomously deploy a drone to an incident location. BRINC, for example, enables autonomous deployment where DFR staff can enter an address in a location bar or drop a pin on a map to fly to the specified location. BRINC is also working with Motorola to enable autonomous drone response based on a signal from GPS-based radios, enabling officers to quickly request drone backup. These software programs can connect to weather sensors and cameras on drone docks, ultimately helping inform a go/no-go decision on drone deployments. Drones can autonomously return to their docking station and redock without human intervention.
- **Evidence Management, Documentation, and Reporting:** These software products can upload and store flight data in the cloud (including relevant video/audio feeds), enabling interfacing with digital evidence management systems (e.g., Evidence.com) and facilitating development of agency- or public-facing dashboards to analyze, report, and manage flight data.

Software Technology – Vendor Spotlight

BRINC	Motorola Solutions	Skydio
BRINC's LiveOps platform enables drone deployment and remote flight operations from a browser, enabling users to automatically dispatch drones to locations and livestream video feeds. LiveOps offers several overlays and visualizations (e.g., airspace awareness, weather monitoring) and enables integration from CAD, automated license plate readers, digital evidence management systems, and more.	Motorola's CAPE, a drone management platform, is a subscription-based software that enables livestreaming video, local and remote piloting, and evidence-grade video management. CAPE can be combined with Motorola's CommandCentral Aware to visualize drone locations and access livestreams with other assets and incident data on a single map. CAPE supports a growing list of drones (e.g., Autel, DJI, Parrot).	Skydio's DFR Command flight management system allows operators to control DFR missions from both command centers and mobile data terminals and enables drone switching for continuous overwatch. Skydio allows for CAD integration and integration with Axon's Fusus RTCC software. Skydio can also pull in Axon body-worn-camera footage and fleet vehicle locations and autonomously deploy drones to officers' locations.

Software Technology – Vendor Spotlight

Aerodome

Aerodome offers a fully integrated drone software that integrates with CAD, pre-CAD 911 data, automated license plate readers, and gunshot detection systems to streamline emergency response. The software can determine whether a 911 call for service warrants a drone response and automatically launch the nearest available drone. Additionally, the software can detect and avoid nearby aircraft, allowing agencies to safely operate drones BVLOS. Aerodome's software is now under the Flock Safety Umbrella.

Paladin

Paladin's Watchtower enables one-platform management of LTE-controlled drones in an agency's fleet, offering live video streams and remote piloting capabilities. This platform can be used in combination with Paladin's EXT2 LTE connectivity to enable autonomous operation capabilities.

Intuitive Robotics

Intuitive Robotics offers a cloud-based Drone Management System for several drone applications and a 5G/LTE connection to enable autonomous flight capabilities and collision avoidance.

Agency Insight

The Redmond Police Department manages tradeoffs while leveraging multiple airframes for its autonomous DFR program.

Chief Darrell Lowe, Chief of Police

Jurisdiction Size: ~73,000 (population); 16.6 square miles
Number of Sworn Officers: 88

The Redmond (Washington) Police Department developed a drone program in 2024 with the intention of streamlining tasks for its law enforcement officers (e.g., search areas, clear calls more quickly) and directing resources to appropriate incidents more efficiently. The department is currently set up with two flight control systems. Although the agency primarily flies Skydio X10 drones, Redmond is also piloting BRINC drones and may leverage DJI products as a backup when needed. Redmond mainly operates its drones autonomously, although it also leverages patrol-deployed drones, released from patrol cars, that can be operated remotely by the flight control center.

Drone flight operations staff currently manage each type of drone using its native flight management software. Redmond Police Department has learned that flight controls vary slightly across different flight management software products. Redmond also noted the lack of ability to hot-swap batteries on dock-based drones (Skydio and BRINC), which led to response inefficiencies.

Chief Lowe noted that the Redmond Police Department appreciated the collision avoidance features on its current drones. Redmond Police Department operates under an FAA-approved BVLOS waiver; however, it intends to implement a ground-based-radar solution in the near future to help manage airspace, as local companies are pursuing drone-based delivery options. Redmond uses several payload features on the drone airframes, such as a speaker, a spotlight, and a parachute; Chief Lowe noted that many of these features (e.g., speaker, spotlight) are valuable for law enforcement applications and should come standard without requiring additional ports.

Other Technology to Support DFR Programs

To enable autonomous drone flight, several agencies are implementing "drone-in-a-box" solutions, or drones packaged with docking stations that enable launch, landing, and charging with minimal human intervention. Many docking stations, such as Skydio's X10 docks (**Figure 4**), offer sensors and functionalities that maximize drone operation time, such as cooling or ice-melting capabilities in or on the dock. Although drone-in-a-box and other docking solutions can help expand autonomous DFR capabilities (with appropriate FAA waivers), agencies also noted tradeoffs such as long charging times (i.e., some docking stations may not allow quick battery swaps).

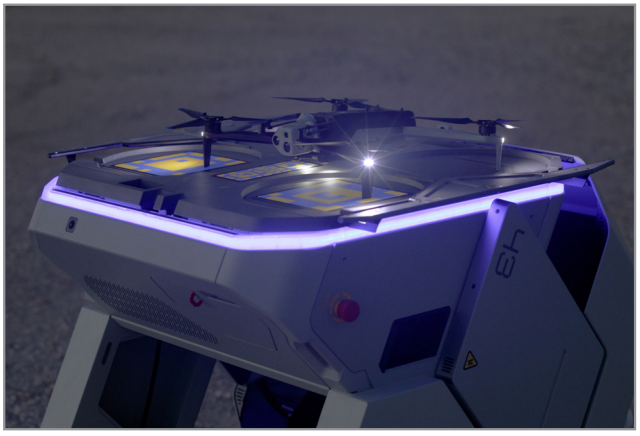

Figure 4: Skydio's dock for X10 (with dimensions 34.1" L × 37.7" W × 55.5" H)

Docking systems may also be outfitted with several sensors to facilitate autonomous deployment; for example, Skydio docks have dedicated radio units that connect with Skydio X10 drones and shift to a 5G/LTE connection when the drone flies out of range.

Cellular connectivity is critical to expanding the range of DFR response and can facilitate consistent communication between the drone and the flight crew. Paladin, for example, offers an EXT module intended to expand operating ranges of DJI M30T or M350 drones.

Adoption and Implementation Considerations

Technical Considerations

Compatibility and Integration

Compatibility and integration with existing agency systems (e.g., CAD, video management systems) is critical to maximizing the utility of the program. For example, an agency operating its DFR program out of its RTCC can simplify workflow for staff by streaming live drone video through its RTCC software. Instead of toggling between systems or relying on separate devices, analysts can view, assess, and act on live video footage within the same interface they use to monitor other data assets (e.g., LPR, CCTV cameras). Seamless connections with Live911 or CAD systems, or even GPS-based radios, can also help autonomously deploy drones more rapidly (e.g., enable deployment to coordinate at the push of a button).

When exploring and assessing which vendor to choose for DFR software solutions, agencies should prioritize integration capabilities. Agencies should ask vendors whether their solution can interface within existing software systems. Ensuring compatibility on the front end helps maximize the value of the DFR program.

Quality

Drone technology (hardware, software, and peripherals) varies in technical and performance specifications. Prior to purchasing, agencies may consider piloting products from multiple vendors and may assess whether these products are fit for purpose; for example, whether the battery life of the drone aligns with the size and scope of the airspace. Additionally, peer agencies with established drone programs can help discerning agencies understand how to assess and

understand the quality of vendor offerings and identify which offerings align with need. Currently, no comprehensive resource comparing technical specifications of all DFR products is publicly available, although specifications for most individual products are readily available on vendor websites. For assessing and understanding quality, agencies should consider evaluating specifications such as battery life and drone range, average speed, average life cycle of parts such as propellers, and integration with peripheral software such as CAD.

Operational Considerations

Policy & Procedure

Like with the adoption of any new technology, a DFR program requires the development of new agency policies and procedures to guide its use. These policies serve multiple purposes: they define the instances in which the drone will or will not be used, document which regulations (e.g., FAA, state) and requirements are followed, establish safeguards for privacy, and align agency goals with community expectations. Typically, policies outline when drones will be deployed, who is authorized to operate them, how data will be managed, and how drone operations will be documented and reviewed.

Agencies developing DFR programs can look to the agencies that have made their drone policies publicly available. These examples can serve as templates or starting points. For example, Montgomery County (Maryland) Police Department,[18] Brookhaven (Georgia) Police Department,[19] and Chula Vista (California) Police Department[20] have made their policies publicly available, and the three policies are similar. Each policy establishes guidelines for privacy considerations, authorized use of drones, prohibited use of drones, and procedures for retention of data from drones. Specifically, all three prohibit the intentional recording or transmission of images where a person would have a reasonable expectation of privacy; prohibit the use of drones for random surveillance activities, harassing, intimidating, or discriminating against an individual or group; and state that the drone will not be weaponized.

Workforce, Staffing, and Culture

Staffing a DFR program with the right personnel is critical to maximizing the effectiveness of the program. Although the technology used for a DFR program provides real-time situational awareness for active incidents, its value is limited without personnel who understand how to assess calls, operate drones, and communicate effectively with dispatchers and responding officers. Despite the importance of staffing, guidance or research to suggest optimal DFR staffing models is limited.

Agencies with a DFR program staff their program with agency personnel, contractors, or a mix of both. If an agency uses contractors, they are typically stationed at the launch site, such as a rooftop, to support operations like swapping out drone batteries. Factors such as budget for hiring new staff, staffing availability, and the skills and capabilities of current staff may inform whether an agency chooses to leverage agency personnel or contractors. As shown in **Table 1**, the benefits and drawbacks differ based on the approach used for staffing.

Table 1: Tradeoffs of staffing approaches for DFR programs

Staffing Approach	Potential Benefits	Potential Drawbacks
Agency Personnel	▪ Understanding of agency systems ▪ Familiar with jurisdiction's geography	▪ May require pulling personnel from other units, which could be prohibitive in a staff-constrained agency ▪ May require additional technical training
Contracted Personnel	▪ Provision of specialized drone piloting expertise ▪ Flexible hiring without impacting sworn/ professional staffing count	▪ Cost ▪ Slower onboarding due to unfamiliarity with agency systems and geography

For agencies that opt to use agency personnel, there are other considerations around using sworn or professional staff. Each approach brings distinct advantages and considerations. Sworn officers offer field experience, an understanding of law enforcement procedures and culture, and credibility with patrol units. An additional benefit is their authority to assess drone footage and determine whether they have probable cause to make an arrest. However, pulling officers from other assignments to staff the DFR program may reduce the number of personnel in other units that already have staffing constraints. Professional staff, such as dispatchers and RTCC analysts, may also be well equipped to support DFR operations. Agencies with established DFR programs have noted that individuals who are successful in these roles have a strong knowledge of agency systems (e.g., CAD), protocols (e.g., call triaging process), and the jurisdiction's geography. With the growing number of agencies adopting DFR programs, the professionalization of positions like a DFR coordinator or program leader is possible, with training, career pathways, and accepted standards to facilitate and operate an effective DFR program.

In addition to determining who will staff the DFR program, agencies must also consider how many personnel are needed and the hours of operation for the program. This decision may be informed by call volume, geographic coverage area, and resources.

Agency Insight

Miami Beach Police Department leverages a team-based staffing approach to carry out DFR missions.

Sgt. Anthony Loperfido, Technical Operations Unit and UAS Program Coordinator, and Lt. Raymond Diaz

Jurisdiction Size: ~90,000 (population), 7.1 square miles land, 10 square miles of water
Number of Sworn Officers: ~400, as of 2023

MBPD staffs its DFR program with a mix of sworn and professional personnel. In its pilot phase, MBPD has one launch site located in its main entertainment district. During the week and on special event weekends, the agency maintains a minimum of one sworn staff member and one professional staff member on duty for the DFR program. This two-person model provides clear role separation and coordination. The professional staff member focuses on piloting the drone, navigating to the scene, and analyzing the situation. The sworn team member manages radio communications, relaying information in real time to dispatch and responding officers. This approach ensures continuous situational awareness and effective communication, which MBPD views as critical to its DFR program.

Training

Although all drone pilots must hold an FAA Part 107 certification, the certification alone is not sufficient preparation for DFR operations. The Part 107 certification is a written exam and does not include any requirement for flight training.[21] Thus, agencies must develop training programs and protocols to ensure pilots are prepared. The National Institute of Standards and Technology has developed NFPA 2400, *Standard for Small Unmanned Aircraft Systems (sUAS) Used for Public Safety Operations*, which outlines the minimum job performance requirements for personnel who operate or support drones and is often used as a benchmark for agencies.[22]

At MBPD, all drone pilots are required to complete a minimum of 80 hours of training prior to certification. In Montgomery County Police Department, training starts with a 40-hour Maryland Police and Correctional Training Commission–approved course, which includes FAA regulations, department policies, and flight practice. Additionally, pilots must pass a pilot proficiency test based on the National Institute of Standards and Technology's *Standard Test Methods for Small Unmanned Aircraft Systems*,[23] complete ongoing monthly training, and advance through a structured progression—including field training and a 20-hour teleoperator course—before becoming a fully certified DFR pilot.[24]

For agencies building their own DFR programs, consulting organizations can be valuable for training. Flying Lion, Inc., for example, offers a DFR vendor-agnostic training center dedicated to enhancing drone deployment in public safety.[25] Additionally, vendors may also offer training on their systems.

Costs and Funding

The costs associated with a DFR program vary across agencies, depending on factors like number of launch sites and the technologies implemented. Some DFR programs may start with individual officers deploying drones as proof of concept.[21] **Table 2** outlines the different costs that agencies should anticipate when budgeting a DFR program.

Table 2: Investments required to launch, operate, and maintain a drone program

Cost Type	Definition	Examples
Initial Costs	Expenses required to establish the DFR program and obtain the necessary infrastructure	▪ Community engagement campaign (e.g., community outreach activities such as attending community meetings or distributing surveys) ▪ Contracts for hardware (e.g., drones, payloads), software, and peripherals ▪ Initial training and certification ▪ Labor associated to set up processes, align on objectives, select and set up launch sites, obtain regulatory approvals (e.g., COW), and evaluate and select technology and vendors ▪ Setup fees and labor for assembling technology systems, integrating with existing systems
Operating Costs	Recurring expenses related to day-to-day functioning of the DFR program	▪ Staff salaries ▪ Ongoing software subscription fees ▪ Vendor service fees ▪ Connectivity costs ▪ Ongoing training and certifications
Maintenance Costs	Expenses associated with keeping the infrastructure functional	▪ Drone (and payloads and peripherals) repair and replacement ▪ Battery replacement ▪ Software updates

Given the number of variables that influence program design, it is challenging to provide definitive figures or even reliable ranges for the total cost of a DFR program. Although **Table 2** outlines the primary types of investment required, the actual investment needed will depend on how each agency chooses to design, implement, and scale its program. Despite this variability, example costs from peer agencies are provided (*right*) as representative benchmarks; these figures have been anonymized to protect agency confidentiality while highlighting real-world costs.

Although many costs are associated with building out a DFR program, the downstream cost savings from a DFR program is important to consider: for example, diverting officers from calls for service that do not need an officer's presence. A study by the Chula Vista Police Department estimates that in 1,000 drone deployments during the study period, live video footage confirmed that patrol response was not needed.[26] Moreover, Brookhaven Police Department estimates that costs associated with drone response are around 10% of the costs associated with dispatching an officer and patrol vehicle.[27]

Examples of Cost Ranges for DFR Programs

Anonymized agency example 1:

- **Cost:** ~ $775,000
- **Cost breakdown:** Includes operating costs per year for four sites, including drones, flight management software, Live911, and Flying Lion (contract) staff.

Anonymized agency example 2:

- **Cost:** ~ $220,000 per year for 6 years
- **Cost breakdown:** Includes two BRINC drones and accessories (e.g., one controller, six batteries), LiveOps unlimited (BRINC's flight management software), unlimited repairs and replacement, annual hardware refresh, and program design support (e.g., policy and standard operating procedures, public outreach campaign guidance, operational consultation, software configuration and implementation, FAA COA filing) during the first year.

Anonymized agency example 3:

- **Cost:** $562,500
- **Cost breakdown:** This amount will cover 75% of the program's total costs and be used to purchase drones, docking stations, cloud software, and related equipment. It will also support staff training, FAA certification, and ongoing maintenance of the program.

Many agencies rely on their annual budget to cover the expenses of the program. Currently, some federal funding sources (e.g., Edward Bryne Memorial Justice Assistance Grant Program[28]) restrict the use of grant dollars for the purchase of drones. However, this may change with new legislation. In February 2025, the Directing Resources for Officers Navigating Emergencies (DRONE) Act was introduced in the House. If passed, the bill would authorize law enforcement agencies to use federal grants to purchase and operate UAS.[29]

Some vendors offer unique cost models designed to simplify budgeting and reduce long-term risk for agencies. For example, BRINC's Safeguard Program provides an all-inclusive warranty through a 5-year contract that covers hardware, software, accessories, training, FAA compliance support, replacements for anything that breaks, and an automatic upgrade to BRINC's latest drone model after the third year. Although the up-front investment is higher than usual DFR contracts, it eliminates the need for follow-on contracts that require approval processes.

Data Management

Data generated through drone operations, such as live video feeds, telemetry data, and flight logs, must be handled with clear, consistent protocols to protect privacy and maintain public trust. Data management in the context of DFR means establishing procedures for how data are collected, protected, stored, accessed, and shared, all in compliance with local, state, and federal regulations.

Governance Considerations

Legal and Regulatory

Agencies interested in developing a DFR program must navigate and adhere to local, state, and federal laws related to drones. In addition to the regulatory frameworks outlined above (see *Navigating Drone Use Regulations*), agencies must be mindful of search warrant procedures and data retention regulations.

Search Warrant Procedures

Across at least 18 U.S. states, legislation explicitly requires law enforcement agencies to obtain a search warrant before deploying drones for surveillance or evidence-gathering purposes, including within DFR programs. These laws reflect a growing consensus that drone use by police constitutes a form of search under the Fourth Amendment and therefore demands judicial oversight through a warrant supported by probable cause. States with these requirements include Alaska, Florida, Illinois, Indiana, Iowa, Maine, Minnesota, Montana, Nevada, North Carolina, North Dakota, Oregon, Tennessee, Texas, Utah, Vermont, Virginia, and Wisconsin.[30] Each of these jurisdictions treats drones as an extension of traditional search-and-seizure powers and applies the same level of constitutional scrutiny as would be required for physical searches.

Most of these states also recognize standard exceptions to the warrant requirement, such as exigent circumstances involving threats to life or property, consent from the property owner, and limited use in specific situations like search-and-rescue operations or documentation of active crime scenes. However, these exceptions are narrowly defined, and routine surveillance or investigative drone use generally requires a court-issued warrant.

North Carolina Drone Law at a Glance

North Carolina's drone statute (N.C. Gen. Stat. §15A-300.1) prohibits surveillance of individuals or private property without consent and places strict limits on law enforcement. Police must obtain a search warrant before using a drone for search or surveillance, unless a narrow exception applies. Exceptions include a high-risk terrorist threat, exigent circumstances such as preventing imminent harm or evidence destruction, or observation of an area already in plain view. Warrantless drone use is permitted for training and photographing public gatherings, but targeted surveillance of a person or residence almost always requires judicial approval.

In addition to the core warrant requirement, many states have adopted procedural safeguards to reinforce accountability. Some impose limits on the duration of drone warrants. For example, Oregon only authorizes warranted drone use for up to 30 days unless extended with judicial approval.[31] Other states enforce data minimization requirements, such as mandating the deletion of drone-collected data unless they are connected with an active investigation. Several states, including Illinois, Minnesota, Utah, and Vermont, require agencies to report drone deployments and outcomes to designated authorities to ensure transparency.[24] Many jurisdictions also prohibit the use of facial recognition technology on drones, ban weaponization, and restrict surveillance of constitutionally protected activities such as peaceful protests.

For DFR programs operating in these states, drone use must either fit clearly within one of the legal exceptions or be supported by a valid search warrant. Missions that involve situational awareness during emergencies, the search for missing persons, or imminent public safety threats may qualify under the recognized exceptions. However, any use involving the observation of private property (i.e., curtilage laws) or individuals in nonemergency situations typically requires a warrant. Agencies must align their operational protocols with applicable state laws, adopt formal internal policies, and maintain thorough documentation to ensure legal compliance and protect the admissibility of drone-collected evidence.

Data Retention

Drone data retention policies for law enforcement DFR programs vary widely across the United States. There is no national standard, and only a few states explicitly regulate how long drone footage can be stored—most states require warrants for drone use but do not specify retention periods. In the absence of clear laws, agencies rely on general evidence retention rules or create their own internal policies. Retention policies often vary based on the type of data. Stricter limits are generally imposed on personally identifiable video and photos. Metadata such as flight logs and telemetry can typically be kept indefinitely because they do not reveal private details about individuals. Most DFR operations do not collect audio.

Local law enforcement agencies have adopted a variety of internal data retention practices, often modeled after existing policies for body-worn and dash camera footage. For example, the police departments in Montgomery County and Brookhaven treat drone video as standard digital evidence, retaining nonevidentiary footage for approximately 180 days and preserving investigative material for 5 years or longer.[32] Other agencies implement shorter retention periods; the New York City Police Department retains drone footage for 30 days; Chula Vista, California, stores recordings for 90 days unless the footage is flagged as evidence.[33,34]

Ultimately privacy and accountability concerns influence retention policies. Short retention periods may reduce the risk of abuse and unauthorized surveillance. Transparency measures, such as public reporting and access controls, help build community trust. Agencies may use audit logs and restrict access to drone data to maintain proper oversight. Reasonable retention windows also support accountability by ensuring footage is available if community complaints or questions arise.

Community

It is best practice for agencies to engage community stakeholders in the development of DFR policies to promote transparency and foster community trust. Involving community stakeholders upstream can help agencies identify and address potential concerns around privacy and surveillance before the program is launched. Brookhaven Police Department proactively sought feedback on its draft policy from the local district attorney and the American Civil Liberties Union (ACLU). Similarly, leading up to the launch of its DFR program, Montgomery County Police Department engaged city council members, community members, and civil advocates to understand their concerns. One of the biggest concerns they voiced was about the use of facial recognition. In response, the agency specifically outlined in its policy that "UAS shall not be used for the purposes of facial recognition or for the collection of audio/voice recordings."[18]

In addition to community involvement in the policy development process, many agencies publish flight maps and data on their website to promote transparency and accountability. This is typically done through online dashboards or platforms where details like flight date, time, reason for flight, and even telemetry data are made available. Montgomery County, Chula Vista, and Brookhaven Police Departments all have public-facing dashboards that are updated daily. Montgomery County's dashboard captures date, time, and location of call for service and a brief description of the incident (**Figure 5**).[35] These dashboards may also capture aggregated metrics that illustrate the potential impact of DFR programs to the community (e.g., impacts to response times, arrest metrics, instances where patrols were rerouted to other calls).

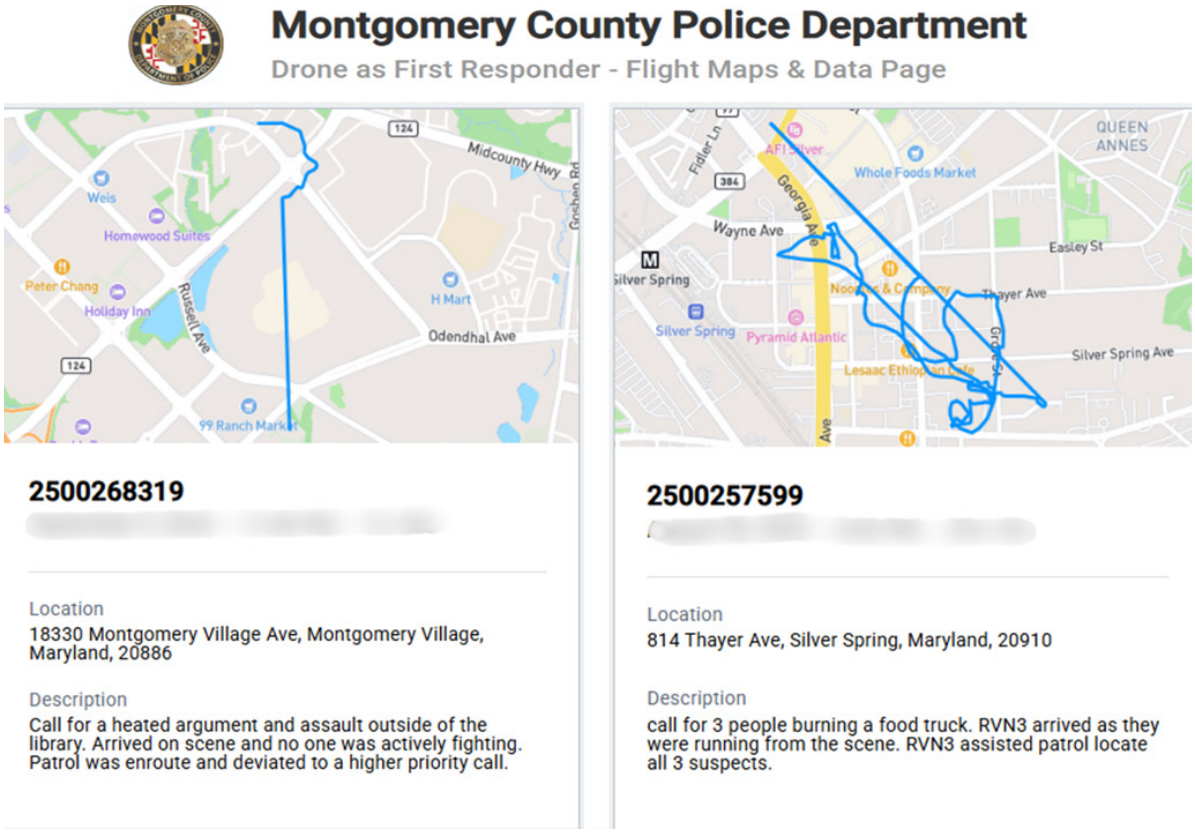

Figure 5: Montgomery County Police Department's public-facing dashboard for its DFR program displays flight maps and related data, such as date and time, location, and incident or call-for-service details. The flight map on the left shows an example where DFR intelligence cleared a call and redirected patrol units. The flight map on the right illustrates how DFR supported the identification and arrest of arson suspects.

When designing a DFR program, agencies should be mindful of biases and unintended consequences that may arise. Bias may be introduced when the flight control team makes decisions about which calls to deploy drones (especially if there are no clear guidelines for when drone response is prioritized or appropriate) and the prepositioned drone launch sites. Certain neighborhoods may feel highly impacted by the presence of a nearby drone launch site, depending on its location, and may even have perceptions of privacy invasion even if the drone is operating within policy requirements. Agencies should leverage data-driven insights to inform and justify launch site selection and should develop clear documentation and decision-making processes for drone go/no-go decisions.

Key Questions to Ask Prior to DFR Implementation

Considerations	Questions to Ask
Purpose and Goals	☐ What problems or challenges are you trying to solve by implementing a DFR program? ☐ What desired outcomes are you trying to achieve by implementing a DFR program? ☐ How likely are these outcomes? How will you measure them? ☐ How are you planning to pilot and scale this program over time?
Technical Considerations	**Compatibility and Integration** ☐ Can the drone software be integrated into the agency's existing systems? If not, what is needed to accomplish this (e.g., infrastructure, staffing, facilities)? **Quality** ☐ What drone models are being considered, and what capabilities do they offer (e.g., battery life)? ☐ What environmental conditions will the drones need to operate under (e.g., weather, terrain)?
Operational Considerations	**Funding** ☐ What is the estimated budget for DFR implementation (e.g., initial, ongoing)? ☐ Where will the agency procure funding for the DFR program? ☐ In addition to initial implementation costs, has the agency considered how it will fund ongoing operating and maintenance costs? **Policy and Procedure** ☐ For what purposes will a drone be deployed? Who is a decision-maker? ☐ During what time frame will the cameras record—from deployment through return or when the drone arrives on scene? ☐ Where will video recordings be stored and for how long? ☐ Who will have access to the video? **Data Management** ☐ Are there policies for access to and retention of data collected by the drones? ☐ What measures are in place to protect privacy and ensure data security? ☐ Are there policies around how long data are stored, who has access to them, and how they might be used in the future? **Workforce and Culture** ☐ What type of staff will be employed by the DFR program (sworn or nonsworn or contractors)? ☐ What will be the operational hours of the DFR program? **Training** ☐ What is the training plan for DFR program staff (initial, ongoing)? ☐ What specific skills and knowledge will they need, and where will they receive this training?
Governance Considerations	**Community** ☐ How will the agency address community concerns around increased surveillance and privacy violations? ☐ How will the agency engage the community about the development of the DFR program? ☐ How will the agency engage the community when establishing policies for the DFR program? ☐ Are procedures in place to regularly assess the program's impact across different geographic and demographic areas? **Legal and Regulatory** ☐ What regulations govern drone use in regard to public safety? ☐ What legal and regulatory frameworks must be adhered to in the operation of a DFR program? ☐ What are the legal guidelines for retention of data collected through a drone?

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