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DRONE AS FIRST RESPONDER PROGRAMS: A NEW PARADIGM IN POLICING

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Dr. Steve King, Shay Major, Marlis McCollum – The MITRE Corporation

In response to a 911 call, a trained police officer dispatches a drone to the scene of an emergency as patrol cars are enroute. The drone arrives within minutes—ahead of the responding officers. Using its video cameras, the drone provides situational awareness to the remote pilot, who relays the information to the responding patrol units on the ground, providing vital intelligence for informed decisions.

This scenario unfolds many times a day at select police departments across the country. These police departments have what's known as Drone as First Responder (DFR) programs, which have introduced a new paradigm in public safety.

There are many reported benefits to these programs—from reduced response time to improved safety for both police and the community. There are many challenges as well for these novel initiatives, not the least of which is societal acceptance.

As more and more police departments in the United States—and the world—consider implementing DFR programs, we need to take an informed look at their benefits, barriers to success, lessons learned, best practices, and coming changes—in the technology, in plans for its use, and in its potential impact on the public.

DFR: What It Is

DFR is a program whereby uncrewed aircraft systems (UAS), or drones, are pre-positioned in a service area (such as the area served by a police department), ready to be launched immediately in response to an emergency call for service.

The goal of DFR is to provide real-time situational awareness to first responders via live streaming over multiple devices, as well as incident management via the police officer operating the drone.

Some departments with DFR programs also have Live911,[1] a software that enables both the drone operator and officers in the field to hear incoming 911 calls in real time. Coupled with information captured by the drone, responding officers can now hear and see what is happening during an emergency before they arrive at the location.

DFR essentially provides aerial intelligence to first responders before they arrive on the scene so that they can bring the appropriate tactics, tools, and resources to bear in an emergency—from the earliest stages onward. These programs are intended to better protect both our communities and first responders.

The drones in a DFR program are piloted by a specially trained teleoperator (TO), who is also an experienced first responder. The teleoperator (often located at police headquarters) controls the flight of the drone as well as the focus of its camera. The teleoperator also provides critical information and incident-management support to the responding officers on the ground.

In addition to the teleoperator, under current Federal Aviation Administration (FAA) safety regulations, a remote Pilot in Command (rPIC) and trained visual observers are used to monitor for manned aircraft in the same airspace as the drone.

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The rPIC is an FAA Code of Federal Regulations Part 107 (Small Unmanned Aircraft Systems)[2] licensed drone pilot who is responsible for ensuring the drone is safe to launch and respond to the emergency. The rPIC is stationed in a location where the drone is visible—such as on a roof—and has the drone controller in hand during the drone's flight. That enables the rPIC to assume control of the drone in an emergency, such as a low-flying helicopter suddenly entering the area. The TO (who is operating the drone from inside a building) may not realize the helicopter is a possible hazard unless it is captured by the drone's camera. In a situation like this, the rPIC has complete control of the drone and can take appropriate actions to ensure there is not a collision.

DFR programs are not the same as drones carried in vehicles (such as police cruisers or fire trucks) that can be launched once first responders arrive at the scene of an emergency. The drones in a DFR program are launched from strategically pre-selected locations in the service area—typically rooftops (of police stations, fire stations, hospitals, etc.)—that provide quick access to the service area in question and provide an unobstructed view of the airspace for safe operations.

[1] https://www.higherground.com/live911/

[2] https://www.ecfr.gov/current/title-14/chapter-I/subchapter-F/part-107

The drones in most DFR programs are used only in response to 911 calls or other requests for emergency services. They are not used for random surveillance, and they are not typically used on routine patrols. There are some exceptions. For example, after obtaining community approval, the Beverly Hills Police Department began using its drone for patrolling to enable quicker responses.

It's also important to understand that DFR drones are an enhancement to the role of the police officer, not a replacement for these officers. Fritz Reber, a former police captain and one of the originators of the nation's first DFR program, explains it this way: "DFR is not cops getting drones quickly on the scene; it's a way for drones to get cops quickly on scene." Formerly of the Chula Vista Police Department (CVPD) in California, Reber is now head of public safety integration for drone manufacturer Skydio.

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The Origins of DFR Programs

DFR began in the FAA's UAS Integration Pilot Program[3] (IPP), conducted between 2017 and 2020. That initiative brought state, local, and tribal governments together with private sector entities—such as UAS operators and manufacturers—to test and evaluate the integration of civil and public drone operations into our National Airspace System (NAS). The goal was to accomplish that integration in ways that balanced local and national interests, addressed security and privacy risks, and accelerated the approval of UAS operations requiring special authorizations.

As part of its participation in the FAA's UAS IPP, CVPD, which serves a Southern California city of 277,000 citizens, developed the concept of operations that became the DFR program, and implemented DFR in October 2018.

As CVPD states on its website: "DFR provides the ability to see what is going on at an incident before emergency personnel arrive on the scene. In addition to the overhead perspective that traditional air support has always provided, DFR allows a trained incident commander to 'virtually' arrive on scene first, sometimes minutes before officers are in harm's way. The drone has a powerful on-board camera that streams HD video back to the department's real-time operations center where the teleoperator, who is a trained critical incident manager, not only controls the drone remotely, but communicates with the units in the field to give them information and tactical intelligence about what they are responding to. The system also streams the video feed to the cell phones of the first responders, supervisors, and command staff, so they can see exactly what the drone is seeing."[4]

[3] https://www.faa.gov/uas/programs_partnerships/completed/integration_pilot_program

[4] *Drone Program | City of Chula Vista (chulavistaca.gov)*

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Since its inception, CVPD's DFR program has deployed its drones in response to more than 15,000 emergency calls. And CVPD's drones have become an integral part of the way the department responds to emergencies. CVPD Police Chief Roxana Kennedy has called DFR one of the department's most important tools in improving situational awareness. She also credits the program with de-escalating many dangerous situations and enhancing the safety of both officers and the community.[5]

After learning of CVPD's success with its DFR initiative, other cities began to follow suit. Today, there are at least 16 police departments with active DFR programs, and another 100 or so are exploring the concept.[6] That's still a small percentage of the nearly 18,000 police agencies in the United States. But interest in DFR programs is growing, not only domestically but internationally as well. In fact, DRONERESPONDERS, which supports public safety uses for drones, announced in 2022 that it would be working with UAS Norway to share U.S. successes with DFR and to advance DFR programs around the world.[7]

Perceived Benefits of DFR Programs

Police departments using DFR report a variety of benefits from these programs, many of which address challenges these departments face—from rising crime rates and staffing shortages to a desire to decrease the number of use-of-force incidents by their officers (de-escalation).

Faster Response Time: Because drones can be launched immediately and fly a straight path to the scene of a crime or other emergency, they can arrive much faster than patrol cars. In fact, many organizations with DFR programs report that their drones often arrive on the scene within two minutes of the 911 call that initiates their deployment. In CVPD's DFR program, for example, drones arrived ahead of officers more than 74 percent of the time. According to the Drone-Related Activity Dashboard on CVPD's website, the department's average drone response time for all calls is just under two minutes, and the average response time for "first on scene" cases is even faster, at 97.38 seconds.[8]

Provide Advance Situational Awareness: DFR drones provide reliable situational awareness to ground units prior to their arrival. Equipped with cameras, sensors, and communication devices, the drones can send live video feeds to the remote pilot and other stakeholders—including responding officers, fire departments, and command personnel—giving them near real-time situational awareness before they arrive on the scene. In the case of a traffic collision, for instance, drones can provide valuable insights to both police and fire departments, such as whether the car is leaking fuel and whether occupants are free of the vehicle or trapped inside.

[5] *Drone Program | City of Chula Vista (chulavistaca.gov)*

[6] *https://www.police1.com/police-products/police-drones/articles/11-ways-police-departments-are-using-drones-V8RZTGOKMjTbWj9Z/*

[7] *Drones as First Responder International Initiative - DRONELIFE*

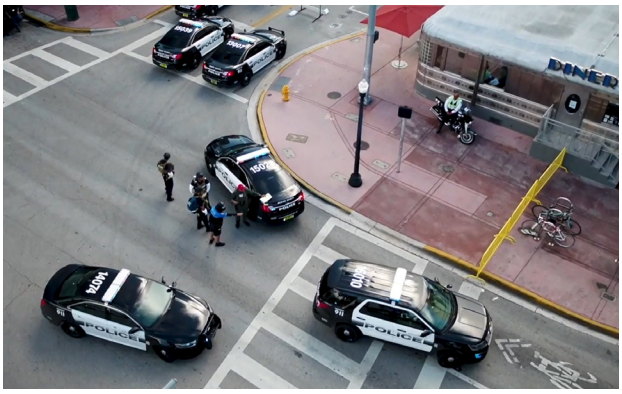
[8] *https://www.chulavistaca.gov/departments/police-department/programs/uas-drone-program*

Promote Officer and Community Safety: With the advance information from their "eye in the sky," patrol units can quickly assess dangerous situations and plan accordingly. This can protect both police officers and citizens. For instance, the drone's video feeds may reveal how many suspects are present, where they are, and whether they are armed. This knowledge can provide a safer outcome for everyone involved.

Help to De-Escalate Situations: The increased situational awareness the drones provide can often serve to de-escalate a situation by enabling officers to use that information to develop sound strategies and tactics before rushing into dangerous situations. For example, drone video feeds can help law enforcement determine that suspects are unarmed, or that the objects believed to be weapons are something else—before they ever interact with the individual(s) whose actions prompted the police response.

For instance, in 2019, CVPD launched a drone in response to a report of a man waving a handgun outside a taco shop. The drone arrived in less than a minute and a half. The teleoperator described the scene to responding officers (who were also able to watch the person via the livestream to their vehicle's computer), saying the subject was acting strangely and appeared to be talking to himself. Later, the teleoperator saw the subject light a cigarette with the object, confirming that it was not a real handgun. With that information, officers were able to safely approach the subject without drawing their weapons, ultimately arresting him for narcotics possession.[9]

In another example, an officer for the Santa Monica Police Department (SMPD) dispatched



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a drone in response to a report of teenagers brandishing a gun. The drone footage almost immediately captured one of the individuals pulling what appeared to be a handgun out of a pocket. But later, while ground units were still on their way, the footage captured one of the teenagers manipulating the weapon, revealing a CO2 cartridge, an indication that this was not a standard firearm but perhaps a CO2 BB gun. That revelation was relayed to the responding officers, de-escalating their response.[10]

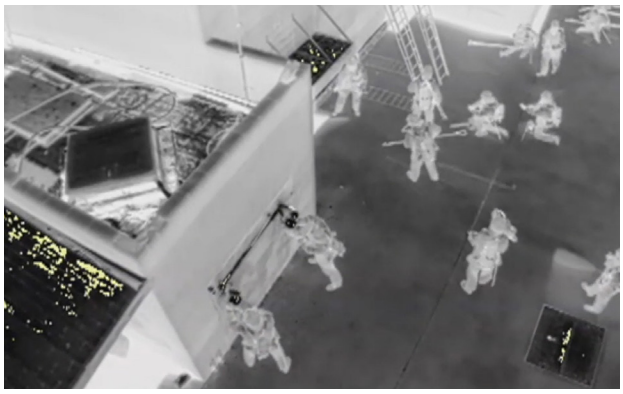
As public outcry has intensified in recent years in response to tragic incidents involving law enforcement and the community, police departments with DFR programs see utilizing drones as a viable part of the solution.

Serve as a Force Multiplier: DFR programs appear to provide staffing efficiencies. CVPD reports that, in approximately 25 percent of the cases in which a drone is dispatched, no ground units are needed, freeing personnel to answer other needs. Other departments with DFR programs report similar results.

[9] https://www.denver7.com/news/america-in-crisis/police-department-using-drones-as-a-tool-for-de-escalation#:~:text=Redmond%20says%20they%27re%20using,Redmond

[10] *SMPD piloting drones as first responders - Santa Monica Daily Press (smdp.com)*

[11] https://www.elizabethnj.org/627/Elizabeth-Police-Department



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According to statistics from New Jersey's Elizabeth Police Department, in 2022 the department's drones responded to 1,400 calls, clearing 21 percent of them before officers arrived.[11] This allowed the department to reallocate those officers to more pertinent calls.[12]

Similarly, Matt Rowland, who oversees the DFR program for the Fort Wayne Police Department (FWPD) in Indiana, which was launched in January 2023, said that for 12 of its first 100 DFR flights, the department was able to issue a "disregard" advisory to responding officers.

CVPD Captain Don Redmond (retired), who is now with BRINC Drones, cites an example where CVPD launched a drone in response to a report of two individuals fighting in a gas station parking lot. A teleoperator dispatched a drone from the roof of police headquarters to the location of the fight. The drone arrived within minutes of the 911 call, enabling the remote operator to view the situation through the drone's cameras. Not seeing anyone fighting, the teleoperator called the store clerk, who came outside to see the drone and stated the subjects had left and police were not needed. Responding officers who were enroute to the scene were informed that the situation had been resolved and were free to take another call.

In addition to clearing calls before officers arrive on the scene, DFR programs have the potential to be a force multiplier in that drones can be dispatched to certain incidents while officers in the field are directed toward others when multiple calls come in simultaneously.

With drones, agencies can best allocate their limited resources in such situations. This may become more and more important in the coming years, if waning numbers of applicants and increasing numbers of departures intensify existing staffing shortages.

Support Investigations and Prosecutions: The intelligence gathered by the drones and their teleoperator often provides officers with information they otherwise would not have had. Chief Kennedy of CVPD recalls one incident where an armed suspect was throwing weapons over a fence to a backyard neighbor while officers were approaching from the front with a search warrant. Since a drone had been sent to the scene, it captured that activity, and officers were able to recover the weapons. By capturing crimes in progress, drone video footage also provides powerful evidence that can support the prosecution of suspects in the court system. In that way, it gets criminals off the streets quickly, and it can save taxpayer dollars as well; in some cases, suspects plead guilty and forego trial in the face of the indisputable video evidence.

Have Advantages Over In-the-Trunk Drone Programs: Many police departments have already tried using drones provided to patrol units. However, these programs sometimes fail. Matt Sloane of Skyfire, a public safety-focused consulting firm that has worked with 600+ patrol programs, said the most typical reasons are that the patrol programs do not have enough drones or pilots to cover the territory, so they tend not to be

[12] https://www.technologyreview.com/2023/02/27/1069141/welcome-to-chula-vista-where-police-drones-respond-to-911-calls/#:~:text=An%20investigation%20by%20MIT%20Technology,any%20regular%20surveillance%20or%20patrols

in the right places when emergencies occur. That means the drones do not get used and funding is reduced. DFR addresses those issues. Just a few drones operated from rooftops can be more effective in meeting emergency needs than drones in cruisers.

Provide Cost-Effective Air Support: While helicopters are well-suited for long-distance pursuit, drones are considered superior to helicopters for overwatch operations. With a helicopter, agencies have only one view of the situation; however, multiple drones can be deployed to provide different perspectives on an incident to support better-informed decisions. DFR programs are also far less expensive than using a helicopter for air support. It can cost millions of dollars to purchase a single police helicopter, with maintenance, fuel, and pilot costs driving the price of operating these vehicles even higher. Helicopter fuel alone costs hundreds of dollars per hour. In contrast, even small police departments can purchase and operate a drone for a relative pittance. For instance, each of CVPD's drones—including long-distance cameras, other sensors, and software—costs about $35,000.[13] And staffing remote pilots at CVPD's four launch locations costs about $400,000 per year. At those technology equipage and staffing levels, the department is able to provide drone coverage for 98 percent of the city's 52 square miles.

Support Beyond Policing: DFR programs are not limited to fighting crime. For example, when police and fire departments are responding to the same emergency—such as a fire or automotive accident—some police agencies provide fire departments with access to their drone livestream video. Fire departments responding to traffic collisions use the drone video to determine what equipment is needed and whether the vehicle's occupants are trapped inside. During transportation accidents, DFR flights also offer an aerial view that helps responders know if there is a fire, if hazardous materials are present, and if there is chemical/product runoff into streams and waterways.

In the case of house fires, the thermal cameras onboard DFR drones can give responding fire personnel advance information about where the hot spots are, enabling them to have an informed action plan when they arrive. Additionally, DFR can provide invaluable oversight of wildfires, such as their locations, access points, and the direction of fire travel.

Many police departments with DFR programs encourage collaboration with local fire departments to more cost-effectively provide the data needed for action planning by all first responders.

The Challenges

Despite their many benefits, DFR programs are not without their challenges. Key among them are community acceptance and regulatory restrictions inhibiting drone use.

Community Acceptance: Although DFR programs are a fairly recent development, drones themselves aren't new to police departments. According to DRONERESPONDERS, more than 3,000 police departments use them for activities such as search and rescue, crime scene documentation, and to track suspects during a chase. They have also been used to oversee public events, including protests, and for periodic checks of certain sites, such as a parking garage that has been the scene of repeated vehicle break-ins.

The use of these devices has raised a variety of concerns about privacy and civil liberty violations.

While DFR programs have so far been limited primarily to responding to emergencies, organizations such as the American Civil Liberties Union (ACLU)

[13] https://www.nytimes.com/2020/12/05/technology/police-drones.html

and the Electronic Frontier Foundation (EFF) fear that those parameters will continue to expand into wider and wider territory over time.

They object, for instance, to drones recording video footage on their way to and from the scene related to the emergency. While some police departments have stopped filming upon the drone's return, some still record during the drone's outward-bound flight. And others leave the decision about when to begin recording to the teleoperator.

For some activists, transparency about drone footage is another bone of contention. For example, *La Prensa San Diego*, a bilingual Latino community newspaper, recently sued Chula Vista to release drone footage to the public. (*La Prensa* lost the case but is appealing the decision.) CVPD's stance is that video and photos collected by its drones are stored for the purposes of conducting police investigations and subsequent prosecutions; as such, they consider the footage and photos unavailable to the public under the California Public Records Act or the Freedom of Information Act.[14]

Additionally, the ACLU is vehemently opposed to drones being used for routine patrol. Although the organization recognizes DFR program uses as distinct from mass surveillance, the organization is concerned that DFR will eventually erode into broader uses.

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Concerns like these must be addressed if a DFR program is to be successful. Without the buy-in of the public and elected officials, the program could be derailed.

For example, a decade ago, the Seattle Police Department purchased drones, intending to use them to support its arson/bomb squad and SWAT team during barricaded situations. However, the use of the drones had not first been vetted with the public. After vehement protests amid fears that the drones could violate privacy or be used as tools of political suppression, the department returned the drones to the vendor.

"Community outreach on drone programs prior to their implementation is the No. 1 most important step for success by showing all policies and procedures, demonstrating the drones' capabilities, and remaining transparent throughout the operation," said DRONERESPONDERS director Charles Werner. DRONERESPONDERS offers a free, customizable Community Outreach Template.

Concerns About Future Capabilities: Organizations like ACLU, EFF, and privacy groups are also raising questions about what happens as technology evolves. For example, drones could soon be combined with license plate readers, equipped with facial recognition capabilities, and more. Some fear advances like these could increase police interactions with groups that already believe they are overly scrutinized.

Regulatory Restrictions: For safety reasons, FAA regulations limit the way in which drones are flown. In many instances, police departments are authorized to fly drones only when they remain within the operator's line of sight. For DFR programs to be effective, most need what is called a beyond-visual-line-of-sight (BVLOS) waiver, which opens up the possibility of longer flights so that police departments can send the

[14] https://www.sandiegouniontribune.com/news/watchdog/story/2023-05-13/la-prensa-chula-vista-police-drone-video-public-records

drone where it is needed. The BVLOS waiver also requires a Certificate of Authorization (COA), which allows the operation to fly as a Public Aircraft Operation (PAO). However, the process of obtaining a BVLOS waiver is the most complex part of the COA approval process, and it hinges on police departments' ability to meet other requirements, such as creating a concept of operations and understanding the airspace in which they will fly. Not all police departments have the technology or the manpower to meet those requirements.

Since a drone has limited flight time compared to a helicopter, police agencies can file a Special Government Interest (SGI) waiver to request 2-to-1 authorization. This FAA waiver allows for the operation of two drones by one remote pilot in command. The authorization enables the flight of two drones from a single location simultaneously, allowing for constant coverage of a situation. When the first drone is low on battery power, a second drone can be launched by the same pilot to respond and replace the drone with a low battery. This 2-to-1 authorization allows police agencies to maintain an indefinite presence until the emergency has stabilized and the drone is no longer needed.

Night-time flights require an additional set of eyes to ensure safe operations. During daylight operations, only one visual observer is required under a COA, but at night the FAA requires two visual observers. If manpower is short, this requirement can limit drone operations at night.

Legislative Restrictions: DFR program capabilities and functionality can vary from state to state. Even though the FAA oversees the safe operations of both crewed and uncrewed aircraft, states have passed legislation limiting law enforcement's use of drones. Some states, such as Arizona, California, Georgia, and Missouri, have not placed legislative restrictions on law enforcement operations. But states like Idaho (I.C. 21-213 (20(a)),[15] Illinois (725 ILCS 167/10, 15 and 20),[16] and Kentucky (KRS 500.130(5))[17] greatly restrict the use of drones unless a warrant is obtained or the law enforcement agency has reasonable suspicion that a drone is needed to prevent imminent harm to life.

Proposed Legislation: In some states, there is proposed legislation that may affect police departments' ability to operate a DFR program. For example, Oklahoma Senate Bill 36[18] requires a law enforcement agency to make any audio or video recordings from uncrewed aircraft available for public inspection. Since police departments consider their drone footage as evidence, the passage of such legislation would probably result in the halt of any plans for DFR programs in the state. New Jersey Assembly Bill 3555[19] is even more restrictive; it would prohibit the use of drones by law enforcement entities. Prior to making plans for a DFR program, police departments should gain awareness of any proposed legislation in their home state.

Meanwhile, the American Security Drone Act of 2023,[20] a bill introduced earlier this year, seeks to ban the federal purchase of drones manufactured in countries identified as national security threats, including China.

[15] https://legislature.idaho.gov/statutesrules/idstat/title21/t21ch2/sect21-213/

[16] https://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=3520&ChapterID=54#:~:text=ILCS%20167%2F10)-,Sec.,a%20drone%20to%20gather%20information

[17] https://apps.legislature.ky.gov/law/statutes/statute.aspx?id=47513#:~:text=(5)%20No%20law%20enforcement%20agency,10%20of%20the%20Kentucky%20Constitution

[18] https://legiscan.com/OK/bill/SB36/2023

[19] https://legiscan.com/NJ/text/A3555/id/2545910

[20] https://www.warner.senate.gov/public/index.cfm/2023/2/warner-scott-introduce-legislation-to-ban-purchase-of-drones-manufactured-in-countries-identified-as-national-security-threats#:~:text=Feb%2021%202023&text=Warner%20(D%2DVA)%20and,security%20threats%2C%20such%20as%20China

Budget and Manpower Limitations: DFR programs will be sustainable only if they are integrated into the department's budget, the way other special programs—such as K-9 units—are. For some departments, the available budget, which includes manpower, covers only part-time use of their drones. Many begin by operating their drones only during specific hours—ideally times when 911 calls tend to be more frequent.

Technology Limitations: Depending on the type of drone purchased and the environment in which it operates, technology limitations can inhibit the success of DFR programs. For example, some DFR drones have a 30-minute battery life, necessitating that the drone returns to the station before its battery power runs out. Most DFR programs have extra batteries they can swap out when the drone returns, but this can sometimes interrupt its mission.

Sometimes the environment plays a role in the success of a DFR program. Agencies in locations with extreme temperatures or excessive rain, wind, or snow find it difficult to operate DFR programs with the current technology. California's Clovis Police Department, for instance, found that the temperatures on its roof—which could reach 110 degrees in July and August—made it difficult to keep a remote pilot on the roof, which it was required to do since it lacked a waiver to operate its drones beyond the visual line of sight of the operator. The temperatures were also too much for the drone. Despite various efforts to combat the problem, the drone continued to overheat when the thermostat rose into the triple digits. That and staffing issues caused the department to put its DFR program on hold.

Concerns About Foreign-Made Drones: Many of the drones used in DFR programs are foreign-made, such as drones from China's DJI, which dominates the drone market. This has raised concerns that non-U.S.-made drones may enable foreign countries to gain access to drone data through the drone's software. Some DFR programs have taken action to address this concern. CVPD, for instance, does not use the onboard software from the drone manufacturer. Instead, it uses an encrypted U.S.-based software program. It also encrypts its drone data and stores it on U.S.-based servers that meet federal requirements for confidential law enforcement databases.

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Cybersecurity Concerns: Regardless of where the drones are manufactured, the use of these devices raises cybersecurity concerns. Just as other systems and devices can be hacked and misused, so can drones.

Lack of Statistics to Support Benefits: While considerable anecdotal evidence is available about the benefits of DFR programs—including some statistics about their ability to reduce the number of unnecessary officer responses (see Benefits/ Serve as a Force Multiplier, above)—there is little other hard data on their ability to improve department efficiency, reduce crime, increase conviction rates, etc. Objective, third-party research is needed to fill this gap.

Tips for Implementing a Successful DFR Program

Fortunately for agencies interested in implementing a DFR program, those who have already done so have insight into what it takes to make these programs a success, and they are willing to share their knowledge.

One of the most vital issues to address, they say, is the need to achieve public trust and acceptance. This requires transparency, accountability, and a lot of relationship-building upfront—with the public, civic leaders, legislators, and groups such as the ACLU and EFF. A key message to convey in meetings with stakeholders is that the DFR program is meant as a 911 response enhancer and is not proactive policing or surveillance. Promoting the value of such programs—with illustrative use cases—is also vital.

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>
> —Charles Werner, Director, DRONERESPONDERS

CVPD took this approach, meeting with local political leaders, community groups, representatives of the ACLU, and other organizations for a year before it even purchased a drone.[21] CVPD then took the community and civil liberty organizations' concerns into account when developing its policies and procedures.

After implementation of its DFR program, CVPD made policy adjustments in response to public sentiment. For example, when the citizenry objected to the drone's camera being pointed downward after completion of its mission, CVPD introduced a new policy, turning the gimbal upward on the return journey so as not to inadvertently record people.

CVPD also put parachutes on its drones, demonstrating its due diligence in mitigating the danger to people and property on the ground.

Toward the goal of transparency, CVPD uses drone software to track all drone flights. It posts the times and paths of its drone missions, along with information about the reasons the drones were deployed. This helps the department ensure the community that drone flights are only responding to calls for service, not conducting routine surveillance.

These are just some of the lessons learned and best practices that have been captured by CVPD and other departments who have implemented DFR programs.

Responsible Use Principles from DRONERESPONDERS

Many of these best practices are also featured in a document produced through a collaboration between DRONERESPONDERS and Skydio. DRONERESPONDERS is a non-profit membership organization devoted to maximizing drone operations for public safety. Skydio is the largest drone manufacturer in the United States. Together they created "The Five C's: Principles on the Responsible Use of Drones by Public Safety Agencies,[22]" which can serve as a valuable resource for agencies seeking to implement a DFR program.

This document organizes the principles into five key pillars: community engagement and transparency, civil liberties and privacy protection, common operating procedures, clear oversight and accountability, and cybersecurity.

[21] https://www.govtech.com/products/for-drones-in-public-safety-responsibility-is-everything.html

[22] https://www.droneresponders.org/the-five-cs

Community Engagement: As stated in The Five C's, DRONERESPONDERS believes it is critical to engage with community organizations that are likely to have reservations about drone use *before* a DFR program is implemented. The organization also recommends treating community engagement "as a continuous conversation, rather than a one-time requirement." New concerns can arise as a program operates, and misinformation can creep in as well. Ongoing engagement can address both.

Transparency: To provide transparency, DRONERESPONDERS recommends creating a website providing information about the agency's policies for drone use as well as up-to-date information about their use. Regular community outreach and media briefings are also recommended.

Civil Liberty and Privacy Protections: In terms of civil liberties, DRONERESPONDERS believes it is critical to honor the rights expressed in the U.S. Constitution's First and Fourth Amendments. For example, the organization emphasizes the need to "respect the rights of journalists and news organizations to conduct their operations without interference," in accordance with First Amendment rights relating to the freedom of the press.

DRONERESPONDERS also advocates for the development of safeguards and training procedures to ensure the protection of citizens' privacy. These procedures should span the acquisition of information, its use, its dissemination, and its retention.

Annual assessments are recommended to ensure compliance with all relevant laws, regulations, and policies—and in accordance with the public will.

Operating Procedures: DRONERESPONDERS says effective policies should cover "FAA compliance: safety procedures (before, during, and after flight operations); reporting requirements; training, proficiency and credentialing requirements; cybersecurity; accident and incident reporting procedures, authorized missions; approval processes; video management procedures; and language prohibiting weaponization."

https://www.droneresponders.org/

For video management, many police departments treat their drone video in the same way they do video from body-worn cameras and other investigative. That means storing footage as evidence that is part of the investigative record and doing so in accordance with pertinent state laws (e.g., rules regarding length of retention, etc.). To support the development of such policies, DRONERESPONDERS provides a variety of resources in its Five C's document.

Oversight and Accountability: Recognizing that policies, by themselves, may be insufficient to ensure the responsible use of drones, DRONERESPONDERS recommends external oversight—such as regular reports to the city council and the formation of community advisory panels—as well as internal oversight mechanisms for conducting regular audits, investigating complaints, etc.

Cybersecurity: To guard against cybersecurity risks, DRONERESPONDERS refers agencies to several resources—from organizations such as the Department of Homeland Security and the Department of Justice—that can help guide the development of cybersecurity policies from acquisition to use.

Other Resources

Agencies and/or companies interested in learning more about DFR programs may also wish to participate in the DRONERESPONDERS Nationwide Working Group, where participants can share their own successes and learn from others.

Additionally, DRONERESPONDERS has posted policy and concepts developed by members of the working group in its online Resource Center.[23]

The Roadmap to Implementing an Effective Unmanned Aircraft System (UAS) Program[24]—developed through a collaboration between the U.S. Department of Justice's Community Oriented Policing Services (COPS) and the Police Executive Forum—is another helpful resource. It highlights best practices that agencies should review when implementing or expanding a UAS program.

Advice from the Field

Those who have implemented DFR programs in their own agencies strongly advocate that newcomers connect with existing users for advice. Drone manufacturers, drone application vendors, and consulting firms with drone expertise can offer insights as well, such as the type of drones and capabilities that will best suit the agency's purposes. For instance, a drone that cannot loiter for more than 20 minutes will not serve a DFR's needs.

The MITRE Corporation's Drone Selector™,[25] a web-based tool, also enables agencies to enter their requirements and identify the drones that meet them and can legally operate within their state. MITRE is a not-for-profit organization that operates in the public interest.

Experienced consulting organizations can be helpful in setting up a DFR program and providing training, provided the agency has the budget for such services. Some can even fill rooftop manpower needs if an agency's existing staff is insufficient to fill that requirement.

District FAA offices can be a helpful resource to understand the drone regulatory environment as well.[26]

In addition to acquiring information, DFR program leaders also advocate sharing information. For example, educating local and state politicians can help them respond to questions citizens may ask about DFR programs. And an understanding of the benefits and parameters of DFR programs can help prevent uninformed legislative activities that could inhibit these efforts.

Having an open-door policy for media, lawmakers, the public, and other agencies wishing to gain information about a DFR program can support the program itself by continuing to cultivate public trust. Sharing success stories via social media can also enhance community support.

Since budget and manpower shortages can derail a DFR program, leaders of existing DFR programs advise making the program an ongoing line item in the department's budget. If funding is an issue, they recommend teaming with the local fire department to share both costs and benefits.

https://droneselector.mitre.org/

[23] https://www.droneresponders.org/

[24] https://www.policeforum.org/assets/UASRoadmap.pdf

[25] https://droneselector.mitre.org/

[26] https://www.faa.gov/uas

https://www.droneresponders.org/

What's Next for DFR?

There is considerable interest in technology capable of flying safely outside the range of the teleoperator's sightline, or BVLOS. Although several police departments have obtained BVLOS waivers from the FAA, those waivers are still restrictive, requiring visual observers along the drone's route to ensure safety. Onboard detect-and-avoid technology may help alleviate some of those restrictions, but it might also engender new public safety concerns.

A positive development is that FAA Regulatory Updates in 2023 have expedited the first responders BVLOS waivers[27] through a checklist template,[28] available through DRONERESPONDERS. As a result, the FAA is now approving these waivers in days—a dramatic improvement over the past.

Visual observers and rPICs standing on rooftops are the most expensive element of DFR programs. The most promising concept for DFR is new technology that will eliminate the need for these rooftop pilots and visual observers. A combination of developing technological solutions has achieved status as the first "test case" to allow technology to work in place of rooftop pilots and visual observers. It uses pre-positioned 360-degree camera nodes to monitor the airspace for both crewed and uncrewed aircraft and a drone dock station (commonly referred to as a "drone-in-a-box") that can autonomously deploy the drone in addition to functioning as a landing pad and charging base. The FAA has granted approval to the Pearland Police Department in Texas to test this emerging technology.

As drone technology continues to change, the potential for integration with other technology will expand the landscape even further. Future innovations will introduce new questions, concerns, and opportunities for DFR programs.

For example, CVPD already has a drone equipped with detect-and-avoid technology that enables it to avoid obstacles without any action by the teleoperator. The drone can also be instructed to follow a particular person or vehicle. Meanwhile, a startup drone company in San Diego has developed a drone that can fly into buildings and inspect the premises without a pilot's help, even in the dark. The advantages of such new capabilities

[27] https://www.faa.gov/uas/advanced_operations/instructions-drone-operators-completing-faa-form-7711-2

[28] https://www.droneresponders.org/post/new-faa-waivers-for-public-safety-and-part-107

are obvious, but increasing autonomy also raises new questions. DFR program operators want to ensure that the value of a human operator—with powers of observation and discernment based on years of trained experience—will not take a back seat to the technology. And privacy concerns may ratchet up as drones are more commonly used in interior spaces and to observe the movements of individuals or their vehicles. For instance, organizations like the ACLU are concerned that such technology might be used to target certain communities, or individuals from certain groups.

Consideration is also being given to integrating drone technology with shot-spotter technology and/or airbag deployments, so that drones can be more quickly deployed in response to situations such as an accident or active shooter event.

Facial recognition technology already exists, raising the question as to whether this technology should be used on DFR drones. Or should it be incorporated into drone technology but activated only in specific scenarios, such as when a child or mentally impaired person is lost? Clearly, the future holds many unanswered questions. At the same time, much has been learned. Public safety agencies utilizing DFR programs have demonstrated numerous benefits to both the police agency and community. These agencies understand that DFR programs need to be regularly evaluated to ensure that they are within developed policies and commitments. Transparency and community acceptance are critical for a successful DFR program. Public safety working with local and regional stakeholders in the development of a DFR program will advance this new paradigm of policing. As technology evolves, introducing new possibilities, research and public-private partnerships will be necessary to prepare an appropriate path forward.

Convinced of the benefits of DFR programs, the DFR community stands ready to work with local communities, government, and industry to evolve and expand these programs to take public safety to the next level.

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