

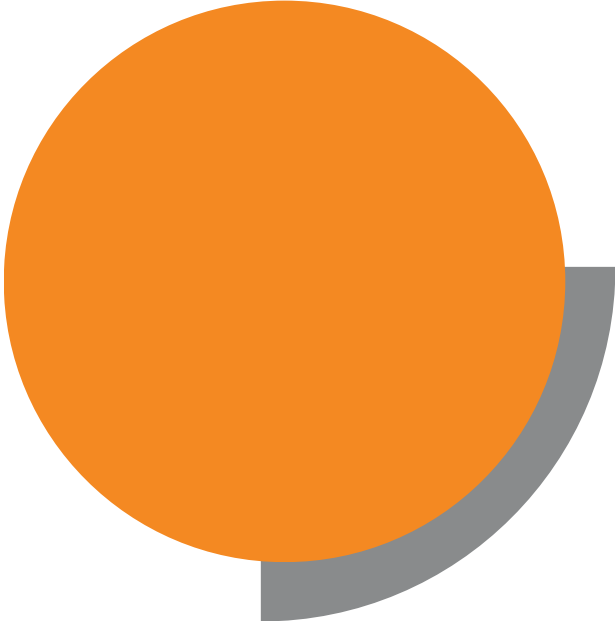


**CPSE
CENTER FOR
INNOVATION**



Guide for the Effective and Ethical Implementation of Drone as First Responder Programs

October 2026

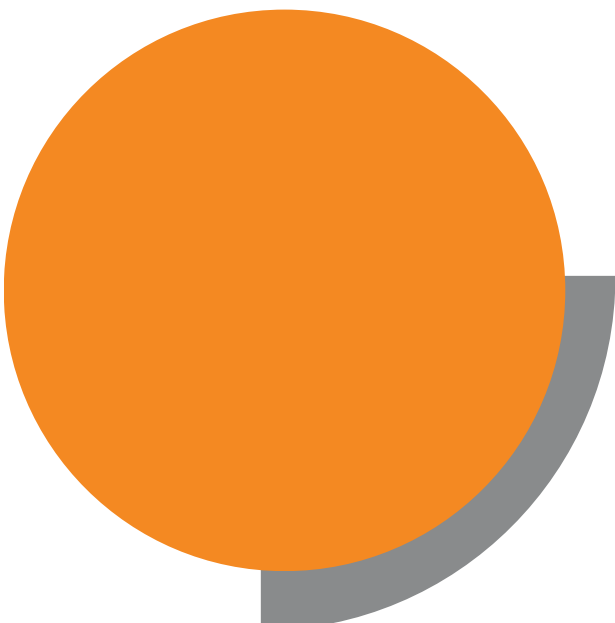


Introduction

Fire departments across the United States are increasingly developing Drone in First Response (DFR) programs, operations where a pre-positioned drone arrives on scene ahead of ground units to provide live video footage and critical situational awareness. In CPSE Center for Innovation's fourth Strategic Scan survey (July 2026), which serves as the basis for this guide, 38% of responding accredited fire agencies currently operate or collaborate on a DFR program. These programs are dispatched to a wide range of incidents—from structure fires and technical rescues to hazardous materials calls and wildland fires—and the majority (72%) operate in partnership with other agencies such as police departments.

The data demonstrate that DFR programs are already influencing operational decisions in meaningful ways. Nearly half of responding agencies report adding, reducing, or repositioning resources based on drone footage. Others use the intelligence to upgrade or downgrade alarm levels, identify hazards and hot spots, improve apparatus staging, and inform tactical mode changes. With 94% of operators holding FAA Part 107 certification and 40% of programs already utilizing autonomous flight paths driven by CAD data, the technology is maturing rapidly.

This implementation guide contains 21 considerations across four categories: Program Need and Design, Technology and Operations, Data, and Engagement and Trust. If an agency decides to implement a DFR program because there is operational need, organizational readiness, and community trust, this guide will assist in the effective and ethical implementation of that program.



Force Multiplier, not Workforce Replacement

DFR programs are **not meant to replace first responders or their expertise**. A drone does not pull hose, treat patients, or make the complex judgment calls that trained firefighters and paramedics make every day. Rather, DFR is a force multiplier, a tool that enhances the capabilities of existing personnel by providing pre-arrival intelligence, improving decision-making, and increasing the safety of responding crews.

Considerations Checklist

Use this page as a table of contents and a checklist to keep track of the program factors you have considered and planned for.

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Category A: Program Need and Design

Topic 01

Defining "Drone as First Responder"

Why it matters:

Without a shared, operationally agreed-upon definition of a Drone as First Responder, or DFR, program, departments cannot benchmark performance, develop consistent policy, secure funding, or communicate clearly with the public.

What you need to know:

A true DFR program is fundamentally different from other drone deployments in its automation, pre-positioning, and operational intent. It is designed to get eyes on scene before boots hit the ground, but not to replace the responders who do the work.

- **Clear distinction between DFR and other drone deployments**

- Trunk-deployable drone is a drone stored in an apparatus or command vehicle and manually launched by on-scene personnel after arrival.
- Scene-deployed drone is any drone brought to an incident and hand-flown for a specific tactical purpose (e.g., scene reconstruction, plume tracking).

These are "drones as assets" rather than "drones as first responders."

- **Core characteristics of a true DFR program:**

- Pre-positioned drones on fixed docking stations
- Computer Aided Dispatch (CAD)-driven or remote pilot-initiated autonomous launch
- Arrives on scene before or concurrent with ground units
- Primary purpose: pre-arrival situational awareness for responding crews

Topic 02

Assessing Organizational Readiness

Why it matters:

Launching a DFR program without assessing institutional readiness leads to stalled implementations, wasted investment, and inter-agency friction. Departments that jump in without groundwork, particularly around staffing, community political climate, and CAD capabilities, report significant challenges.

What you should do:

Conduct an honest internal assessment across six dimensions before committing resources: technology, partnerships, politics, budget, workforce, and community sentiment.

Key Considerations:

- **Do I need a DFR Program?**
 - Consider your department's call volume, geographic coverage challenges, response time gaps, and whether existing resources are being stretched thin on low-acuity calls that a drone could triage.
- **Current drone capabilities and experience**
 - Departments with existing trunk-deployable or scene-deployed drone programs have a significant head start as they may already have Part 107-certified personnel, operational familiarity, and internal credibility that can be leveraged for DFR expansion.
- **Existing relationships with internal and external partners**
 - Departments with strong pre-existing labor-management and inter-agency relationships often experience little to no resistance when launching DFR programs, making relationship quality a key predictor of success. Inter-agency relationships often include police and can include others such as dispatch centers and utilities.
- **Community political climate regarding surveillance technology**
 - Assess whether your community has existing sensitivities around surveillance (e.g., automatic license plate reader debates, body camera controversies). These signal the level of proactive engagement you'll need before launch.
- **Budget capacity and appetite for multi-year investment**
 - DFR is not a one-time purchase; it requires sustained investment in staffing, maintenance, connectivity, insurance, and hardware refresh cycles, typically on 2 to 3-year replacement timelines.
- **Workforce availability and willingness to create new roles**
 - Municipal HR processes for creating new job classifications can take many months so start this process early.
- **CAD system capabilities and integration potential**
 - If your CAD system cannot assign a call sign to a drone or trigger automated dispatch, you will face workarounds that may degrade data quality and response time advantages.

Topic 03

Partnership Models

Why it matters:

A majority of DFR programs that involve fire departments operate in partnership with law enforcement, making inter-agency dynamics the single most common structural feature (and potential structural risk) of DFR programs. The partnership model you choose determines your level of operational control, data ownership, financial exposure, and long-term sustainability.

What you need to know:

There is no single correct model, but each carries distinct trade-offs that must be explicitly negotiated and documented before launch, not discovered after the fact.

Models:

- **Unified/neutral governance: Housing the program under emergency services or a joint advisory board**
 - Housing the program under a neutral Emergency Services umbrella broadens institutional support and prevents ownership disputes between fire and police.
- **Three-way partnerships: Fire, police, and utilities splitting costs and access**
 - Consider non-obvious partners. Cost splits with police and utilities for example demonstrates that other potential partners have legitimate operational interests in drone capability and can share the financial burden.
- **Independent fire department programs**
 - Supplementing PD infrastructure with fire-owned assets. While rare, independent programs give fire departments full control over dispatch triggers, data governance, and operational priorities at the cost of bearing the full financial and staffing burden.

Key considerations:

- **Establish an advisory board with equal representation.**
 - This helps ensure no single agency (fire, police, EMS, city administration, civilians) dominates decision-making, ensure decisions reflect diverse interests, and provides institutional durability beyond individual champions. Additionally, a neutral third party with decision authority (e.g., mayor's office representative) can serve as a tiebreaker to prevent deadlock and maintain program momentum.

Partnership Models Continued

- **Defining decision-making authority for fire-specific deployment triggers.**
 - Fire departments must negotiate which call types drones will be dispatched to for fire/EMS purposes, independent of law enforcement priorities.
- **Formalizing agreements through Memorandum of Understandings or Intergovernmental Agreements.**
 - Formal governance structures provide institutional durability, prevent any single agency from dominating the program, and create clear pathways when disagreements arise. Verbal agreements and handshake deals do not survive leadership transitions or budget disputes; formalize everything in writing.
- **Planning for leadership transitions and long-term sustainability.**
 - Programs built around a single champion are fragile; governance structures must outlast the individuals who created them.

Topic 04

Funding Strategies

Why it matters:

There is no single dominant funding model for DFR programs, and financial sustainability is a frequently cited concern among departments looking to scale. Programs that rely on a single funding source, particularly competitive grants or politically volatile budget lines, face significant sustainability risks.

What you should do:

Diversify funding streams from day one, develop financial metrics that speak the language of municipal finance, and build the business case for long-term investment before your initial funding runs out.

Strategies:

- **Municipal capital improvement plans: Multi-year escalation models approved by council**
 - Capital improvement plans provide the most stable long-term funding because they are approved in multi-year cycles and are less vulnerable to annual budget challenges.
- **Partner cost-sharing: Splitting costs among fire, police, and other municipal departments**
 - Cost-sharing reduces per-agency burden and creates mutual accountability which strengthens long-term stability.
- **Vendor agreements: Negotiating multi-year contracts with drone manufacturers**
 - Long-term agreements (typically 7-10 years) lock in favorable pricing and ensure equipment stays current but create vendor dependency. Negotiate technology refresh clauses, data ownership and transfer provisions, and contract exit terms.
- **Building the business case: cost per flight hour, resource optimization savings, risk reduction**
 - Financial metrics are the primary currency for communicating program value to elected officials, city/county councils, and grant funders, making their development a strategic priority for program sustainability.

Topic 05

Definition

Temporary Flight Restriction: An FAA-imposed restriction on an area of airspace due to hazardous conditions, special events, or security concerns. (Source: faa.gov)

Drone Placement and Network Design

Why it matters:

Where you place drones determines what you can cover, how fast you can get on scene, and whether the program delivers on its core promise of pre-arrival situational awareness. Poor siting decisions waste resources and create coverage gaps that undermine credibility.

What you need to know:

Siting is a constrained optimization problem driven by battery life, call volume, geography, and airspace. Mature programs prioritize call volume density over simple geographic coverage.

Key Considerations:

- **Siting criteria:**

- **Call volume and demand density (primary driver for mature programs).** A data-driven approach that prioritizes where the drone will actually be used.
- **Geographic coverage and overlap.** Coverage circles often overlap to ensure there are no gaps; a drone must be able to reach a scene, provide meaningful on-scene time, and return within a single battery charge.
- **Battery life constraints dictating maximum range and on-scene time.** This is the single most important hardware constraint shaping network topology; plan for worst-case battery scenarios (cold weather, headwinds, prior flight depletion).
- **Airspace restrictions.** Your jurisdiction may have restrictions near airports, military installations, and border zones and may impose Temporary Flight Restrictions or (TFRs). Conduct geographic coverage analysis to identify gaps early, particularly in areas with military airspace restrictions or proximity to airports.

- **Leveraging non-fire-department buildings for dock placement.**

- Unconventional partnerships with school systems and utilities represent creative solutions to geographic coverage challenges (and the need for a flat rooftop) without requiring new construction.

- **Planning for network expansion over time (phased rollout).**

- Start with high-value sites that demonstrate quick wins, then expand based on demonstrated value and available funding.

Topic 06

Operational Use Cases for Fire/EMS

Why it matters:

Defining specific, defensible use cases is essential for justifying the program's existence to elected officials, building public support, and ensuring that deployments remain within legal and ethical boundaries. Use cases also drive your dispatch protocols, training requirements, and performance metrics.

What you need to know:

Fire/EMS use cases are typically less controversial than law enforcement applications. Use cases can be leveraged in public messaging.

Use Cases:

Structure fire response:

- **Pre-arrival size-up**

- Provides incident commanders with critical decision-making information before arrival, enabling better resource allocation and initial strategy formulation.

- **Thermal imaging for hotspot detection and overhaul**

- Aerial thermal cameras can identify hidden fire extension in rooflines and attics that ground-level thermal imaging cameras cannot see, improving overhaul efficiency and reducing rekindle risk.

- **Monitoring for structural collapse indicators**

- Aerial observation can detect sagging rooflines, bulging walls, or progressive collapse indicators that ground-level personnel may not observe from their vantage point.

Emergency medical response:

- **Locating patients in large areas**

- Drones with thermal imaging can locate unconscious or immobile patients in areas where ground crews would spend significant time searching on foot (e.g., parks, campuses, rural settings).

- **Delivering Automated External Defibrillators (AEDs) or naloxone ahead of ground units**

- Resource delivery represents a developing use case with life-saving potential for time-critical interventions like cardiac arrest and overdose.

- **Traffic accident scene assessment and hazard identification**

- Aerial views reveal vehicle positioning on interstate interchanges, fluid spills, downed power lines, and patient count faster than ground-level assessment, enabling more accurate resource requests.

Operational Use Cases Continued

Wildland fire:

- **Fire perimeter mapping and progression monitoring**
 - Provides real-time fire behavior intelligence that informs resource deployment, evacuation decisions, and containment strategy.
- **Identifying spot fires and ember cast**
 - Aerial detection of spot fires ahead of the main front enables rapid suppression before they establish, protecting structures and preventing entrapment.

Technical rescue:

- **Swiftwater rescue: Locating victims, assessing current and hazards**
 - Drones provide immediate situational awareness in water environments where conditions change rapidly and ground-level visibility is limited. They also enable the operator to provide GPS coordinates of victims to boat and ground crews. Some platforms allow the drone to drop a floatational device.
- **Structural collapse: Mapping debris fields, identifying void spaces**
 - Aerial mapping creates an immediate operational picture that guides search priorities and heavy equipment placement.
- **High-angle rescue: Assessing anchor points and access routes**
 - Drones can survey cliff faces, building exteriors, and tower structures before committing personnel to technical rescue operations.

Topic 07

Scaling Strategies

Why it matters:

The difference between a successful pilot and a sustainable program is the ability to scale — adding coverage, increasing utilization, and expanding use cases without proportional increases in cost or complexity.

What you should do:

Plan for scale from the beginning, even during your pilot phase, by choosing platforms, governance structures, and staffing models that can grow, and by documenting the evidence base that justifies expansion.

Key Considerations:

• Geographic expansion:

- **Phased docking station deployment based on call volume data and coverage gaps.** Use your operational data to identify the next highest-value site; each new station should demonstrably improve coverage or reduce response times to an underserved area.
- **Balancing coverage breadth vs. redundancy depth.** Decide whether your next investment should extend coverage to new areas or provide backup capability in existing high-demand areas; both have operational justifications depending on your risk profile.
- **Cross-jurisdictional expansion and mutual aid agreements.** As your network grows, drones near jurisdictional boundaries can serve neighboring communities; formalize this through mutual aid agreements that address liability, data sharing, and cost allocation.

• Operational expansion:

- **Adding call types to dispatch protocols.** Start conservatively with high-value call types and expand as you demonstrate reliability and build dispatcher confidence.
- **Integrating new capabilities as they mature.** Adopt new capabilities such as thermal imaging, gas detection, and payload delivery, only when they are operationally proven and address a documented need; avoid being a beta tester for unproven technology in life-safety applications.
- **Assisting with Federal Urban Search and Rescue operations.** You may face limitations if using a foreign vendor for your drones.

• Organizational scaling:

- **Developing training capacity to reduce vendor dependency.** As your program grows, the cost and scheduling constraints of vendor-provided training can become limitations; invest in train-the-trainer programs and internal curriculum development.
- **Building institutional knowledge that survives personnel turnover.** Document everything including procedures, lessons learned, vendor contacts, and regulatory history so the program doesn't lose critical knowledge when key personnel depart.

Topic 08

Long-Term Sustainability

Why it matters:

Innovative public safety programs can launch with enthusiasm and initial funding but fail later due to budget cuts, leadership changes, or loss of institutional support. DFR programs are particularly vulnerable because they are new, expensive, and lack the deeply embedded institutional inertia that protects traditional apparatus and staffing.

What you should do:

Build sustainability into your program's DNA from day one by diversifying funding, embedding the program into standard operations, cultivating broad institutional support, and continuously demonstrating measurable value.

Key Considerations:

- **Financial sustainability:**

- **Transition from grant funding to operational budget line items.** Grants are startup fuel, not long-term sustenance; begin advocating for permanent budget allocation within the first year of operations.
- **Demonstrate ROI through documented cost avoidance and efficiency gains.** Every dollar saved through false alarm verification, reduced apparatus wear, or avoided overtime is valuable as budget justification; track and report these savings relentlessly.
- **Diversify funding sources to reduce single-point-of-failure risk.** Programs dependent on a single council member's support, a single grant, or a single partner agency's budget are one decision away from defunding.

- **Institutional sustainability:**

- **Embed DFR into standard operating culture.** When the drone is treated as a valuable resource, it becomes institutionally difficult to eliminate; keep it in "pilot" status and it remains perpetually vulnerable.
- **Cultivate multiple internal champions across ranks and divisions.** A program with one champion is left vulnerable when that person promotes, retires, or loses political capital; build support at every level from line firefighters to chief officers to elected officials.
- **Document institutional knowledge and succession plans.** The program must be able to survive the departure of any single individual, including its founder; ensure no critical knowledge exists only in one person's head.

Category B: Technology and Operations

Topic 01

Platform Selection

Why it matters:

The DFR technology ecosystem is often fragmented, with multiple competing platforms that do not yet natively integrate with common Computer-aided dispatch (CAD) and records management system (RMS) software. Failing to plan for integration can create operational friction, data silos, and scalability problems that can be expensive to fix later.

What you should do:

Prioritize CAD integration and data interoperability over flashy features when selecting platforms and discuss data access in every vendor contract.

Key Considerations:

• Integration:

- **CAD system compatibility.** Talk to your vendor about how your drone platform connects to your CAD system, and how they are working to ingest CAD data and support full flight automation (more in next section).
- **Mobile data terminal / incident management software integration.** The ability to show drones and apparatus on the same map is ideal for operational integration.
- **Live video feed distribution to responding units.** Technical capability exists, but actual utilization by line crews is often low if not made simple; plan for how feeds will realistically be consumed during response.
- **Post-flight reporting and data archival.** Some vendor platforms offer built-in reporting with customizable questions; leverage these rather than building parallel systems.
- **Network connectivity requirements and challenges.** Poor connectivity degrades live stream quality to the point where it undermines the program's core value proposition; assess bandwidth before deploying docks.

• Hardware considerations: docking stations, hives, battery management, weather resilience

- Battery management is a hardware-level metric with direct operational implications as reduced battery life from prior flights affects subsequent response readiness and must be tracked.

• Vendor relationship management and contract negotiation

- Require full data access and data portability provisions in all contracts to ensure operational data can be migrated if you need to change vendors; avoid sole-source dependencies.

Topic 02

Definition

CAD call sign: unique identifier assigned to a resource within a Computer-Aided Dispatch system that enables automated timestamp tracking (dispatched, en route, on scene, cleared) comparable to traditional apparatus.

CAD Integration and Dispatch Protocols

Why it matters:

The absence of CAD system integration with flight programs creates time consuming and redundant tasks, such as requiring the remote pilot to manually move address information from the CAD data to the flight software. System integration and autonomous flight after dispatch increase DFR program efficiency and data quality.

What you should do:

Assign drones a dedicated CAD call sign, then work toward full data automation as a medium-term goal while using interim solutions like one-button dispatch bridges.

Key Considerations:

- **Defining launch call types and triggers**

- Determine which incident types (structure fires, cardiac arrests, person down, etc.) should trigger drone deployment. This is a policy decision that should be documented and periodically reviewed.

- **Current state: most programs require manual dispatch processes**

- While it is required that the drone be launched by a human, data integration issues require manual processes. Dispatcher workload and human error can result in missed flights, reduced situational awareness, and diminished program value; track dispatch delay as a key performance indicator (KPI).

- **Ideal state: Quick Deployment and CAD call signs**

- One-button dispatch allows remote pilots to launch drones with one click, initiating autonomous flight quickly and removing the need for manual entries.
- CAD call signs (treated as a resource like an engine or battalion chief) enable consistent, auditable data capture with minimal additional effort. The associated timestamps allow you to calculate response time metrics, demonstrate time advantages over ground units, or compare drone performance to apparatus performance.

Topic 03

Operational Protocols

Why it matters:

Clear standard operating procedures (SOP) prevent mission creep, protect against liability, ensure consistent operations regardless of who is flying, and provide the documented framework that regulators, attorneys, and the public can evaluate.

What you should do:

Develop written SOPs for every phase of drone operations (from dispatch through post-flight) and review them quarterly during the first year, then annually thereafter.

Key Considerations:

- **Decision Frameworks**

- Document the complete list of call types and the priority logic when multiple incidents compete for the same drone simultaneously.
- Document when to upgrade, downgrade, or cancel resources based on drone intelligence

- **Best practices:**

- Assign a specific person (e.g., rear-seat firefighter, company officer) to monitor
- Use audio callouts from dispatch
- Push critical information via radio rather than expect visual monitoring

- **Handoff procedures: Transitioning situational awareness from drone operator to Incident Command (IC)**

- Define how information flows from the pilot to the IC (e.g. radio channel, video feed access, verbal briefing format) so that critical intelligence doesn't get lost in translation.

- **Weather limitations and no-fly criteria**

- Document specific wind speed, precipitation, visibility, and temperature thresholds beyond which operations are suspended; these should be based on manufacturer specifications with an added safety margin.

- **Emergency procedures: Lost link, flyaway, low battery, system malfunction**

- Every operator must know what to do when the system fails; these procedures should be memorized and regularly drilled, not just written in a manual.

- **Documentation requirements: Flight logs, video retention, incident reporting**

- Every flight must be documented with timestamps, purpose, outcome, and any anomalies; this data feeds your performance metrics, satisfies legal discovery requirements, and supports continuous improvement.

Topic 04

Definition

Real-Time Crime Center:
A centralized facility that integrates surveillance feeds, data analytics, and communications technology to provide real-time intelligence support to field operations.
(Source: bja.ojp.gov)

Staffing Models

Why it matters:

Staffing dedicated drone pilots is a commonly cited operational barrier across all focus group participants. The model you choose determines your coverage hours, operational independence, and long-term scalability.

What you need to know:

Every model has trade-offs between cost, control, and coverage. Most departments will need a hybrid approach to achieve 24/7 operations, and you should plan for this from the beginning rather than discovering gaps after launch.

Models:

- **Dedicated civilian tactical flight operators: Purpose-built role**
 - Provides the most operational independence and consistency but often requires navigating municipal HR processes for new job classifications.
- **Police real-time crime center operators: PD staffs; fire has access**
 - Lowest cost to fire departments but creates dependency on police staffing decisions and priorities; fire-specific calls may not receive the same attention during high-demand law enforcement periods.
- **Cross-trained fire personnel: Part 107-certified firefighters filling in as supplemental pilots**
 - Provides operational flexibility without new hires but pulls personnel away from their primary duties; best used as a supplemental staffing model.
- **Dispatcher-integrated: Training existing dispatch personnel to manage drone launches**
 - Leverages existing 24/7 staffing but adds workload to already-busy dispatchers; track missed flights due to dispatcher task saturation as a key metric to determine whether this model is sustainable for your call volume.
- **Hybrid models: Combining multiple approaches for 24/7 coverage**
 - Most mature programs use a combination of dedicated operators during peak hours and cross-trained personnel or dispatcher-initiated flights during off-hours to balance cost against coverage.

Staffing Models Continued

Key staffing considerations:

- **Minimum staffing for 24/7 operations.** Account for vacation, sick leave, training days, and turnover when calculating minimum headcount; understaffing leads to coverage gaps that undermine program credibility.
- **Training pipeline and certification requirements.** Part 107 certification is the floor, not the ceiling; operators need scenario-based training, emergency procedures, incident command system familiarity, and ongoing proficiency checks (more in next section).
- **Consider applying for FAA 4-to-1 waivers.** These allow one operator to manage up to four drones, reducing the number of staff needed.

Topic 05

Definition

FAA Part 107: The FAA's Small Unmanned Aircraft Systems rule that governs commercial drone operations, requiring operators to pass an aeronautical knowledge test and obtain a Remote Pilot Certificate. (Source: FAA, 14 CFR Part 107)

Training and Certification

Why it matters:

Inadequate training creates operational risk, legal liability, and reputational exposure. A single crash or privacy incident caused by operator error can set a program back years in public trust. Training is also the mechanism through which organizational culture shifts from skepticism to adoption.

What you should do:

Develop a tiered training program that distinguishes between awareness-level training for all personnel, operational training for dispatchers and officers, and expert-level training for dedicated pilots.

Key Considerations:

- **FAA Part 107 certification as baseline requirement**
 - This is the legal minimum for any commercial drone operation; budget for initial testing fees, study materials, and recurrent testing.
- **Beyond Part 107: Operational proficiency, emergency procedures, and scenario-based training**
 - Part 107 tests aeronautical knowledge but does not assess actual flying skill or decision-making under pressure; supplement with hands-on flight hours, flight simulators, and realistic scenario exercises.
- **Awareness training for line personnel**
 - Line crews who don't understand what the drone provides, or its limitations, won't use the information effectively; brief training during company drills can dramatically improve utilization.
- **Operator training: When and how to launch, prioritization during multi-incident periods**
 - Operators must understand both the technical process (which button to push) and the decision framework (which calls warrant deployment when multiple incidents compete for the same asset).
- **Ongoing proficiency requirements and recurrency standards**
 - Establish minimum monthly flight hours or quarterly evaluations to prevent skill degradation; document everything for liability protection.
- **Vendor-provided training vs. in-house training program development**
 - Vendor training gets you operational quickly and provides great resources, but you should also invest in developing internal training capacity for long-term sustainability and institutional knowledge.

Category C: Data

Topic 01

Data Collection and Reporting

Why it matters:

The fire and emergency service's ability to make evidence-based decisions about DFR adoption depends entirely on the quality and consistency of data collected by early-adopter programs.

What you should do:

Implement automated data collection wherever possible, supplement with structured manual data capture for qualitative metrics, and commit to sharing de-identified data with industry partners and researchers to build the collective evidence base.

Key Considerations:

- **Automated data capture:**

- **CAD-integrated timestamps.** Automated capture of dispatch, launch, on scene, and cleared timestamps eliminates human error and ensures consistent data quality; this requires CAD integration as a prerequisite.
- **Flight telemetry.** Most drone platforms capture route, altitude, duration, and battery consumption automatically; ensure it's being stored, not just generated, and that it's accessible for analysis.
- **Video metadata.** Metadata enables efficient retrieval and analysis of variables such as start/stop times, camera settings, and thermal/visual mode without requiring review of entire video files.

- **Manual data capture:**

- **Post-flight operator reports.** Keep these brief (5 minutes maximum) to ensure compliance; use structured forms with dropdown menus rather than free-text narratives and include information such as incident type, information provided to IC, and any issues encountered.
- **Incident commander feedback.** This is the most valuable qualitative data point but the hardest to collect consistently; integrate questions (was drone information useful? did it change decisions?) into existing post-incident documentation workflows.
- **Maintenance logs.** Track every maintenance event including repairs, replacements, and downtime causes to identify patterns, predict failures, and calculate true lifecycle costs.

- **Reporting cadence and audience:**

- **Weekly: Operational summary for program managers.** Enables rapid identification and correction of emerging problems before they become systemic by including information on flights, issues, and maintenance.

- **Monthly: Performance dashboard for department leadership.** Key performance indicators, trends, and notable incidents provide leadership with the information they need to advocate for the program and make resource allocation decisions .
- **Quarterly: Advisory board report.** Formal reporting inclusive of comprehensive performance reviews and policy recommendations to your governing body ensures accountability and provides structured opportunity for policy adjustment.
- **Annually: Public report.** A community-facing summary of program activity, outcomes, and plans fulfills transparency commitments and provides material for elected officials, media, and community stakeholders.
- **Contributing to industry knowledge:**
 - **Publish case studies and lessons learned.** The fire service learns through shared experience; document your successes and failures for the benefit of departments considering DFR adoption.

Topic 02

Data Governance

Why it matters:

Unclear data ownership, inconsistent retention policies, and unresolved questions about public records requests create legal vulnerability and erode public trust.

What you should do:

Establish a comprehensive data governance framework before your first operational flight.

Key Considerations:

• Data ownership:

- Does the operating agency, partner agency, or vendor own the footage? This question must be answered definitively in your agreements.

• Storage and retention:

- **Where is data stored?** On-device, local server, vendor cloud, or government cloud options carry different security, accessibility, and cost implications; government cloud solutions offer the best balance of security and compliance but may require procurement processes.
- **How long is data retained?** Retention periods should be driven by legal requirements, operational needs, and privacy principles, not by default vendor settings or unlimited storage capacity.
- **Who has access?** Implement the principle of least privilege: personnel should only access data they need for their specific role, and all access should be logged and auditable.

• Vendor data practices:

- **Where does vendor-processed data reside?** Particularly relevant given ongoing concerns about foreign-manufactured drone platforms; verify data sovereignty provisions contractually.
- **What access does the vendor retain to operational data?** Ensure contracts explicitly limit vendor access to what is necessary for maintenance and support, and prohibit secondary use of your operational data.
- **Data portability if you change vendors.** Require contractual guarantees that all operational data can be exported in standard formats if you terminate the vendor relationship.

• Public record considerations:

- **Is drone footage public record?** Consult your jurisdiction's public records law and your agency's legal counsel to determine disclosure obligations before you accumulate footage.

Topic 03

Key Performance Indicators (KPIs)

Why it matters:

Without rigorous, standardized metrics, DFR programs cannot demonstrate value to funders, identify operational deficiencies, or contribute to the broader evidence base that the fire service needs to justify industry-wide adoption. The absence of standardized metrics makes it difficult to compare programs or establish best practices.

What you should do:

Implement a tiered metrics framework that captures operational, financial, and outcome data from day one. Even if you're not fully confident in the data quality, retroactive data collection is difficult and early data, even imperfect, helps establish a baseline.

Key Metrics:

Operational metrics:

- **Response time: Drone dispatched-to-on-scene vs. first apparatus dispatched-to-on-scene**
 - This is the foundational metric that demonstrates the core value proposition; track it for every flight and report it using the 90th percentile, meaning 90% of flights arrived in this amount of time or less.
- **Beat rate: Percentage of calls where drone arrives before first ground unit**
 - The higher this number, the more frequently the program delivers its primary benefit; target and track improvement over time.
- **Flights per day/week/month: Volume and utilization rate**
 - Low utilization may indicate dispatch protocol gaps, staffing shortages, or maintenance issues; high utilization validates investment and justifies expansion.
- **Availability rate: Percentage of time drones are mission-ready vs. down for maintenance, charging, or weather**
 - This metric reveals infrastructure reliability and maintenance program effectiveness.
- **On-scene time: Duration of useful aerial observation per incident**
 - Longer on-scene time (constrained by battery) provides more value; track whether battery limitations are causing premature departure from active incidents.

KPIs continued

Outcome metrics:

- **Situational awareness impact: Did drone information change tactical decisions?**
 - This is the hardest metric to capture but the most important for demonstrating operational value; survey incident commanders after drone-assisted calls.
- **Safety impact: Incidents where drone information prevented personnel exposure to hazards**
 - Document specific instances where drone intelligence caused commanders to change approach routes, upgrade assignments, or withdraw personnel.
- **Patient outcome correlation: Response time improvement for medical calls and relationship to patient outcomes**
 - While causation is difficult to establish, correlation between faster information and better outcomes supports the life-safety narrative.

Financial metrics:

- **Cost per flight hour.**
 - Calculate fully loaded cost (hardware amortization, staffing, maintenance, connectivity, insurance) divided by flight hours to establish a unit cost that can be compared across programs.
- **Cost avoidance.**
 - Resources not deployed based on drone triage. When a drone verifies a false alarm and prevents a full assignment from responding, calculate the cost of those apparatus miles, personnel hours, and fuel saved.
- **Apparatus wear and mileage reduction.**
 - Track whether drone deployment on low acuity calls measurably reduces apparatus mileage and maintenance costs over time.

Topic 04

Continuous Improvement

Why it matters:

DFR technology, regulations, and community expectations are evolving rapidly; a program that doesn't continuously adapt will become obsolete, non-compliant, or misaligned with community values.

What you should do:

Build formal continuous improvement mechanisms into your program structure (e.g., after-action reviews, regular policy audits, technology assessments, and community feedback loops), so that adaptation is systematic rather than reactive.

- **After-action review process:**

- **Review significant incidents where drone was deployed.** Use the same AAR framework you apply to significant fire incidents and review what worked, what didn't, and what to change; drones are an operational tool that deserve the same rigor of post-incident analysis.
- **Review incidents where drone should have been deployed but wasn't.** Missed opportunity analyses reveal dispatch protocol gaps, staffing shortages, or equipment availability issues that suppress value.

- **Policy and procedure review:**

- **Annual SOP review and update cycle:** Regulations, technology, and operational experience all evolve; SOPs that aren't reviewed annually become outdated guides that can be ignored.
- **Policy alignment with evolving regulations:** Assign responsibility for regulatory monitoring (FAA, state, local) to a specific individual; regulatory non-compliance discovered after the fact can ground your program and create legal liability.

- **Stakeholder feedback integration:**

- **Line personnel feedback: Are crews actually using drone information? What would make it more useful?** If responding crews aren't watching the feeds or incorporating drone intelligence into their tactics, the program isn't delivering its intended value regardless of what the metrics say.

- **Operator feedback: Is the dispatch process workable? What causes missed flights?** Operators are the gatekeepers of drone deployment in most programs; their workflow constraints directly determine program utilization rates.

- **Partner agency feedback: Is the partnership working? Are there unresolved friction points?** Schedule formal partnership reviews at least annually; small irritations left unaddressed become program-threatening conflicts over time.

Category D: Engagement and Trust

Topic 01

Privacy Protection Framework

Why it matters:

Privacy is the issue most likely to generate organized public opposition, media scrutiny, and legal challenges that can disrupt a DFR program.

What you should do:

Develop and publish a comprehensive privacy framework before launch that addresses collection minimization, use limitations, and transparency and then demonstrate adherence through auditable practices.

Key Considerations:

- **Collection minimization principles:**

- **Altitude and camera angle management to minimize incidental collection.** Higher altitudes reduce the ability to identify individuals; straight-down or straight ahead camera angles minimize views into backyards and other areas where privacy is expected.

- **Transparency mechanisms:**

- **Published privacy policy accessible to the public.** Write it in plain language, not legalese; make it findable on your department's website and reference it in community presentations.
- **Regular public reporting on flight statistics and purpose.** Quantitative transparency (number of flights, call types, response times) builds confidence that the program operates within stated boundaries.
- **Community complaint and inquiry process.** Provide a clear, accessible mechanism for residents to ask questions or raise concerns, and respond to every inquiry promptly and respectfully.

Topic 02

Community Engagement Strategy

Why it matters:

Community engagement is essential to program success. Investing in pre-launch outreach often leads to lower opposition and complaint rates post-launch. Public trust is not automatic and must be earned through deliberate, sustained, and genuine engagement that begins before the first drone flies.

What you should do:

Develop a phased community engagement plan that starts 6–12 months before launch, intensifies during the launch period, and continues indefinitely as a core program function rather than a one-time checkbox.

Key Considerations:

• Pre-launch engagement:

- **Identify and engage stakeholders early.** Don't wait for opposition to organize; proactively seek out potential critics such as neighborhood associations, civil liberties groups, elected officials, and the media and engage them in program design so they become invested in its success.
- **Host public forums, town halls, and demonstration events.** Live demonstrations are an effective engagement tool; seeing the drone in person and understanding its capabilities (and limitations) dramatically reduces fear and misconception.
- **Leverage fire department's inherent community trust advantage.** Fire departments consistently enjoy high levels of public trust; use this advantage deliberately in messaging and ensure your operations don't erode it by mission-creeping into surveillance territory.
- **Address concerns proactively rather than reactively.** Acknowledge privacy concerns as legitimate rather than dismissing them; demonstrate specific safeguards you've implemented in response to community input.

• Ongoing engagement:

- **Regular public reporting on program activity and outcomes.** Publish annual reports with flight counts, call types served, response time improvements, and any complaints or incidents; transparency breeds trust.
- **Social media presence showing operational successes (with appropriate privacy protections).** Short, compelling videos of drones responding to structure fires or locating missing persons build public support more effectively than any policy document; ensure all shared footage is appropriately redacted.

- **Community advisory committee with civilian membership.** Include community members, particularly from historically surveilled or marginalized communities, in ongoing governance to ensure the program remains accountable to the people it serves.
- **School and civic group presentations.** Educational outreach normalizes the technology and builds long-term community support; focus on explaining the "why" (saving lives, protecting firefighters) not just the "what" (cool technology).
- **Develop clear, consistent messaging that emphasizes life-safety mission.** Every public communication should lead with the life-safety purpose and specific examples of how drones help firefighters and residents, not with technology specifications. (more in next section)
- **Distinguish between general anti-drone sentiment and specific programmatic concerns.** General opposition to drones is difficult to address; specific concerns about your program's policies and practices can be resolved through dialogue and policy adjustment.

Topic 03

Messaging and Public Communication

Why it matters:

How you talk about your DFR program shapes public perception more than what the program actually does. Framing drones as "flying security cameras" versus "aerial first responders" produces dramatically different public reactions to identical technology, making strategic communication a core operational competency.

What you should do:

Develop a communications playbook with pre-approved messaging, designated spokespersons, and scenario-specific talking points that every member of the organization can use consistently.

Key Considerations:

• Core messaging principles:

- **Lead with life-safety mission, not technology capabilities.** "This drone helps our firefighters know what they're walking into before they arrive" is more compelling and less threatening than "This drone has 4K cameras with 30x optical zoom and thermal imaging."
- **Use concrete examples and stories, not abstract policy language.** A single story about a drone arriving at a structure fire two minutes before the first engine and revealing that occupants were trapped in the rear is worth more than any policy document.
- **Acknowledge limitations and boundaries honestly.** Admitting what the drone cannot do (fly in high winds, see through walls, replace firefighters) builds credibility more effectively than overselling capabilities.

• Audience-specific messaging:

- **Elected officials and municipal management: Cost efficiency, constituent safety, innovation leadership.** Speak their language: cost per call, response time improvement, liability reduction, and competitive positioning to peers.
- **Community members: Safety benefits, privacy protections, transparency commitments.** Address their concerns directly: "Here's how we protect your privacy." "Here's how you can file a complaint." "Here's what we'll never use this for."
- **Media: Compelling visuals, human interest stories, data-informed outcomes.** Provide B-roll footage, arrange ride-alongs with drone operators, and offer data that tells a story; media coverage shapes public opinion more than any direct outreach.

Topic 04

Internal Buy-in and Labor Relations

Why it matters:

Internal buy-in is as important as public support. How you communicate with firefighters and labor leaders directly affects whether the DFR program is viewed as a helpful operational tool or an additional burden, making trust and early engagement essential to long-term success.

What you should do:

Address Engage firefighters and union representatives early, address concerns about surveillance and workload directly, and frame the program as a safety and operational tool that helps crews make better decisions, reduce risk, and go home safer.

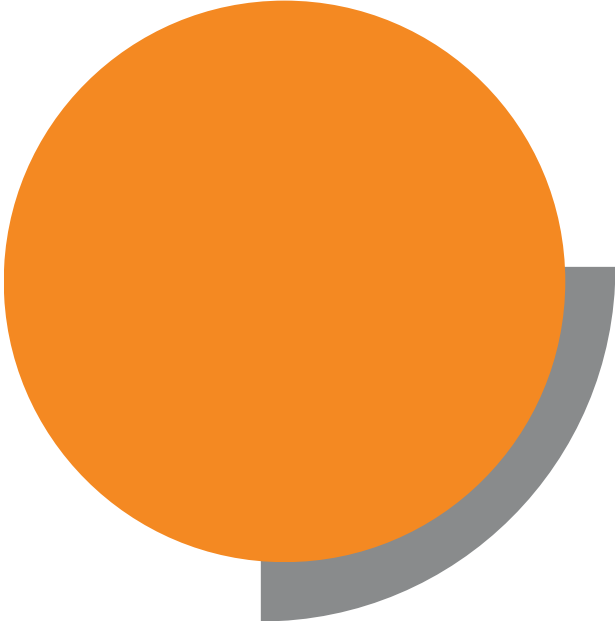
Key Considerations:

- **Labor-Management Trust:**

- **Departments with strong pre-existing labor-management relationships often experience little to no resistance when launching DFR programs.** As mentioned in the organizational readiness section, a strong relationship with the union is also a key predictor of success.
- **Treat the union as a strategic partner, not a late-stage reviewer.** Involve union representatives early in planning, listen to their concerns, and show how their feedback shapes policy, deployment decisions, and operational safeguards.

- **Crew-centered messaging:**

- **Address surveillance and workload concerns directly.** Be clear about how the program will and will not be used, who has access to drone footage, and how the department will prevent the technology from becoming an unnecessary administrative burden.
- **Lead with firefighter safety and operational value.** Position the DFR program as a workforce multiplier that gives crews better information before they arrive, improves situational awareness on scene, and supports safer decision-making.
- **Show how the program helps crews do their jobs better.** Firefighters care about whether the tool reduces risk, improves operations, and helps them go home safer; lead with those benefits rather than budget justifications, political value, or technology features.

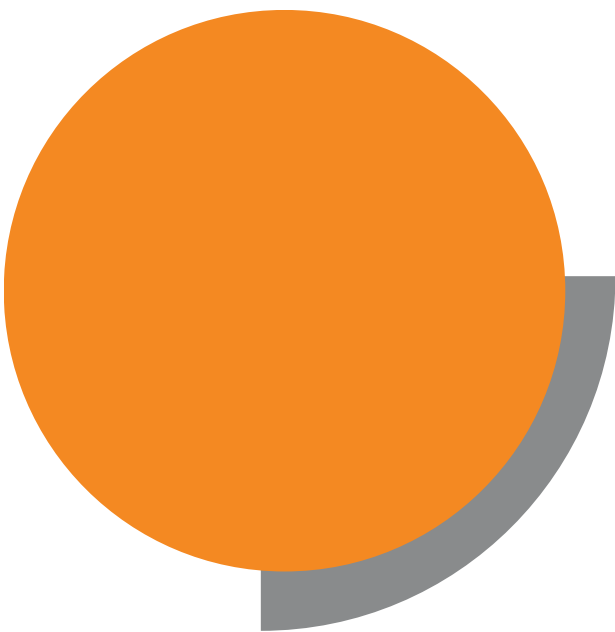


Methodology

The findings and context presented in this position paper are drawn from the CPSE Center for Innovation's fourth Strategic Scan, published in July 2026. The Strategic Scan surveyed Center for Public Safety Excellence (CPSE)-accredited fire and emergency services agencies across the United States to capture a snapshot of current technology adoption, emerging operational practices, and strategic priorities within the CPSE community.

Data for the report were collected via a voluntary online survey distributed to 259 agency fire chiefs. The survey instrument included both quantitative and qualitative items addressing program operationalization and technology integration. Over 100 fire chiefs responded to the survey, (n=102), providing a 39% response rate. From that data, seven geographically diverse departments, representing both metropolitan and suburban communities, were invited to participate in a task force.

The task force met three times over Zoom for one hour each session. These open dialogues allowed the CPSE Center for Innovation team to learn more about the age of programs, their goals, partnerships, funding, community engagement, and how data are collected and integrated. In addition to the Strategic Scan, the insight gleaned from the task force meetings heavily informed this position paper.

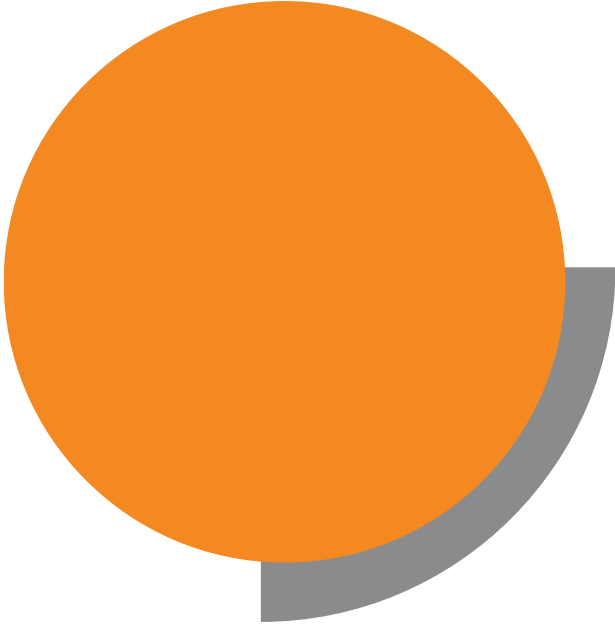


Use of Artificial Intelligence

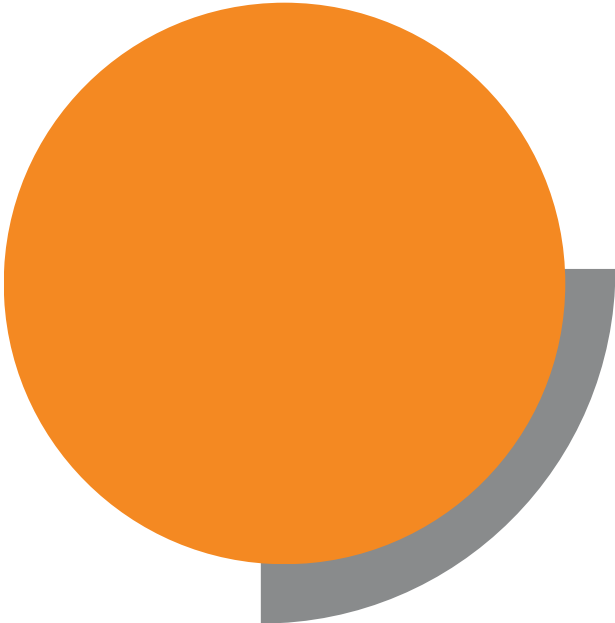
All research, data collection, and firsthand accounts presented in this report are the product of real human effort and lived experience. No AI tools were used to gather data, conduct interviews, or generate research findings.

AI assistance was utilized only in the following capacities:

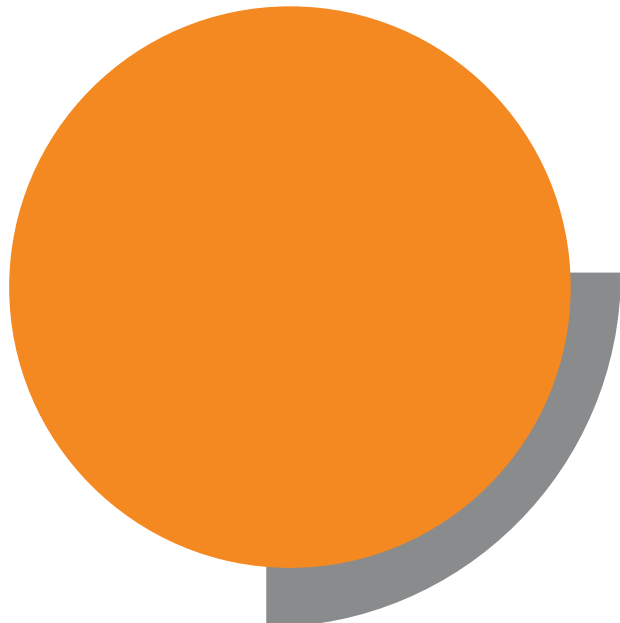
- Thematic analysis: AI was used as a supportive tool to help identify and organize emerging themes across the data.
- Drafting and editing: AI assisted with drafting language, improving clarity, and refining the overall readability of the written report.



Read our Strategic Scan Report



Read our Urban Fire Forum Position Paper



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