

THE DAY OF THE DRONE IS HERE

EFFECTIVELY DEPLOYING UNMANNED AERIAL TECHNOLOGY IN STATE AND LOCAL GOVERNMENT



government
technology

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INTRODUCTION

Drones are changing how state and local governments serve the public in ways big and small. In 2015, a series of dramatic drone-powered rescues during flooding in Texas won national media coverage and captured the public's imagination. Similar footage now routinely makes its way into television and social media, but the real potential of the technology may be in places like Sherman, Texas.

In this city of 41,000 people, a consumer-level drone helps the fire department conduct investigations after fires. It also allows Sherman's economic development organization to document the city's industrial park at a fraction of the cost of manned aerial photography and create video footage promoting local concerts and other civic events. City Manager Robby Hefton calls the drone "the best \$1,500 we ever spent."

While drones have gained an early foothold in public safety, enterprising government agencies and departments are exploring their use in other areas, from transportation and public works to planning and environmental services.

ENTERPRISING GOVERNMENT AGENCIES AND DEPARTMENTS ARE EXPLORING THE USE OF DRONES IN MANY AREAS, INCLUDING TRANSPORTATION, PUBLIC WORKS, PLANNING, ENVIRONMENTAL SERVICES AND MORE.

Regardless of use case, drones have the potential to help government agencies complete vital public tasks more efficiently and safely by providing insights and information that weren't previously available — or were prohibitively expensive to obtain. Increasingly, they are replacing manned helicopters or contracted services such as aerial photography and utility and damage inspection, as was the case when drones checked the condition of Houston levees following 2017's Hurricane Harvey.

"It gives you a perspective of your jurisdiction you can't get on the ground," says Richard McKinney, former CIO of the U.S. Department of Transportation and a Center for Digital Government (CDG) senior fellow.

An era of confusing regulations and limitations is coalescing into a workable framework for safe operation, even as local governments explore

more exotic use cases, like medicine delivery and pesticide application. Some municipalities are even looking at drones as an alternative to fireworks in wildfire-prone regions. And as drone technology becomes more affordable, it is easier for governments of all sizes to experiment and scale operations within or across agencies.

As they consider their options, U.S. public sector leaders must think carefully about how to build strategies around the deployment, operation, data management and policy environment for drones. This handbook explores current trends in state and local government adoption, provides data from a June 2018 CDG survey of nearly 220 public sector leaders, and identifies strategies and best practices officials should consider as they evaluate how drones could help meet the needs of their communities.

THE TRENDS

There's little debate among public sector leaders that drones are part of their agencies' futures. Virtually all CDG survey respondents — 92 percent — say drone technology will have a significant impact on state and local government.² Just shy of a third (32 percent) have implemented drones on a limited or widespread basis in their departments or agencies, and nearly half of the remaining respondents (46 percent) are considering or have definite plans to adopt drone technology. Only 21 percent have no plans to use or deploy drones.

USE CASES EXPANDING

Many of the use cases for drones can be lumped into three Ds — dull, dirty and dangerous work, and state and local government agencies do plenty of all three. However, public safety and emergency preparation dominate present-day public sector use cases for drone adoption.

According to a 2018 study by the Center for the Study of the Drone at Bard College, at least 910 state and local public safety agencies have acquired drones, up 82 percent from 2017.³

County and municipal police and sheriff's departments represent more than two-thirds

of these agencies, followed by fire/EMS and emergency management departments. There are now more than twice as many public safety agencies with drones than ones operating manned aircrafts, the study notes.

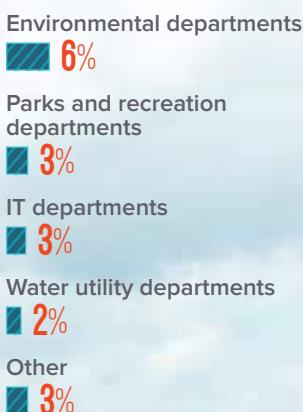
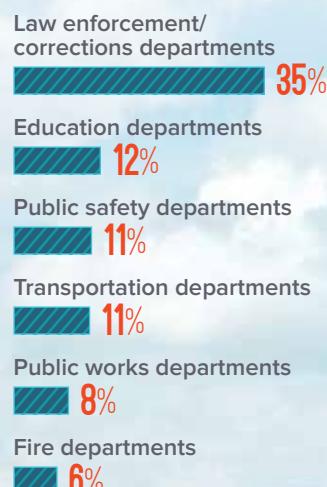
Public safety functions are also the top motivations cited by CDG survey respondents. A separate CDG analysis of requests for proposals (RFPs) involving drones found more than half (52 percent) come from public safety agencies, including law enforcement, corrections and fire departments. Transportation and public works departments also are significant users — but the number of RFPs in these areas were dwarfed by public safety.

At the same time, local governments are using drones for remote access in hard-to-reach areas and aerial photography, but the "long tail" of applications and practices continues to grow.

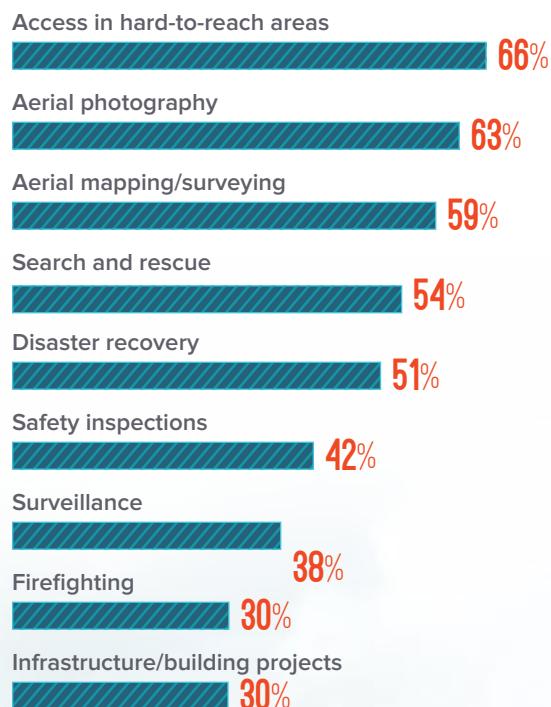
A MILLION DRONES (AND COUNTING)

To understand how technology has transformed the drone market and opened the door for new use cases within and

DRONE RFPS BY DEPARTMENT



KEY DRONE USE CASES



Traffic monitoring **27%**

Accident reconstruction **26%**

Expanding services provided **12%**

Weather monitoring **11%**

Agriculture **4%**

Other/none of above* **5%**

* Other use cases include public health, engineering, disaster protection, parks and recreation, drainage, investigations, local homeland security, land records, communications, engineering and construction.

*Respondents could select more than one option.



DRONES ARE ...

Useful technology



Interesting, but too many barriers to implement now



Interesting, but the technology needs to progress



A necessary tool our organization relies on



Not useful to our organization



Other/none of the above



* Due to rounding, numbers add up to more than 100 percent.

beyond the public sector, look no further than your pocket.

A little more than a decade ago, smartphones offered a fraction of the capabilities of today's mobile devices. But since the iPhone debuted in 2007, the technology has improved exponentially.

At the same time, businesses determined the growing functionality of these ubiquitous mass-market products are suitable for their use and adopted them in the enterprise, a process known as "consumerization."

In similar fashion, as drone technology has matured over the past decade, large fixed-wing drones with military lineage have been replaced in enterprise settings by smaller, inexpensive — and often

consumer-grade — platforms.

"A military drone is millions of dollars' worth of infrastructure," says Doug Couto, former CIO of the Michigan Department of Transportation and a CDG senior fellow. "Now you can buy a commercial-grade drone for under \$3,000."

And much as downloadable apps have made smartphones the 21st-century equivalent of Swiss Army knives by allowing their users to select the tools they need most, today's drones have become platforms upon which different sensors and applications can be swapped in and out depending on users' needs.

Today, more than one million drones have been registered with the Federal Aviation Administration (FAA) by hobbyists and organizations alike. They've been on the cover of *Time* and

companies like Amazon have promoted them as the future of package delivery. Their rapid adoption has prompted the FAA and other policymakers to move much more quickly than anticipated to develop a regulatory framework — to use an appropriate metaphor — while the plane is flying.

"Most manned aircraft take years to be certified," says Mark Blanks, director of the Mid-Atlantic Aviation Partnership (MAAP), which has been an active test site for unmanned aerial vehicles (UAVs) for most of the decade. "We're doing this on a timetable that's compressed because the technology is advancing so quickly."⁴

REGULATIONS AND LACK OF TRAINING SLOW ADOPTION

The rapid technological progress sparked by consumerization is also driving growing sentiment among government leaders that drones are ready for public sector use. Just 11 percent of CDG survey respondents said the technology needs to progress for drones to become practical, while fewer than one quarter cited insurmountable barriers to implementation. Twice as many respondents say drones are vital tools for their organization than think the technology isn't useful.

However, operational and regulatory challenges remain significant hurdles that public sector leaders need to address. On the operational side, more than half of survey respondents said they need

more technical support and training for their operators. The training issue is a particular challenge. Nearly half of respondents (49 percent) cited the lack of trained staff as an obstacle — the most commonly cited issue, even above the cost and regulatory concerns that often constrain public sector initiatives.

There's also no denying the current regulatory landscape on both the state and local level has impeded adoption. More than half (59 percent) of survey respondents said uncertainty about future laws and regulations is an obstacle to their use of the technology, while half (50 percent) cited uncertainty about current laws and regulations.

BEYOND THE NUMBERS

Beyond the topline trends, the story of public sector drone adoption varies dramatically — by type and size of department, by use case and above all, by location.

“Even in one state, if you go from one area to the next, it’s completely different,” says Garret Bryl, an aerospace software engineer who flies drones as a volunteer for the regional Public Safety UAS Response Team of North Texas and a local fire department.

For many agencies, though, the starting point is seeing the technology in action, according to Bryl, who was interviewed by *Good Morning America* and other national media following his role in 2015’s Texas floodwater rescues, which are widely believed to be the first using drones.

“The minute state and local leaders get an idea of what these things are capable of, they’re awestruck,” he says.

STATE AND LOCAL GOVERNMENT DRONE ADOPTION

No definite plans, but under consideration



Limited deployment to test viability/usefulness



No plans



Definite plans to procure/deploy



Fully deployed across multiple sites



Other



* Due to rounding, numbers add up to more than 100 percent.



MOTIVATIONS FOR DRONE ADOPTION

Increasing public safety



Preparing for an emergency



Performing tasks more quickly



More effective than older methods



Safer for employees



Lower cost



Ease of use



Public education/outreach



* Respondents could select more than one option.

GETTING STARTED

Best practices to deploy and operate drones in the public sector are beginning to emerge, but the vast differences in size, scope and mission across the spectrum of agencies means there's no universal roadmap.

"There's no one integration model that works," says Romeo Durscher, director of public safety integration for DJI, who

has researched the subject with both U.S. and European public service agencies.⁵ "It depends on how a department is structured."

However, experts within and outside of the public sector can point to strategies to help leaders get started, navigate acquisition and technical hurdles, and manage the increasing number of (literal and logistical) moving

parts as operations begin to scale. Among them:

IDENTIFYING A STRATEGY

The first question is whether the department or agency needs to operate its own drones, or, as is often the case with today's manned aerial systems, partner with outside providers or regional services to conduct operations for them. Regional networks and smaller interagency agreements



have resulted in pooled resources and equipment in many areas of the country, according to Dan Gettinger, co-director of the Center for the Study of the Drone at Bard College. Other agencies, including the Idaho Department of Transportation, began working with drones by contracting for services from a commercial vendor.

For agencies and departments that elect to move forward with a drone program of their own, the next question involves how to get started — a question one expert dubs “go big or go small.”

“There are departments that immediately buy in and get a \$50,000 budget or grant together, while others start small and see how it goes,” Bryl says. “I haven’t seen any middle ground.”

The answer to this question often depends on the size of the department and the locality it serves, but there are benefits to both approaches. Large RFPs give departments more control over pricing and technology, while small experiments allow departments to build a case for broader adoption, as well as the budget to support it.

Regardless of how you begin, “getting a drone program started

LEADERS OF EVEN THE SMALLEST DRONE EXPERIMENTS MUST CONSIDER THE RANGE OF REGULATORY, TECHNICAL AND PROCUREMENT ISSUES THEY MIGHT ENCOUNTER.

isn’t as simple as buying a drone,” says Bill Chen, enterprise partnerships manager for DJI.

Even the smallest experiments must consider the broad range of regulatory, technical and procurement issues described in more detail later in this guide. Thinking through these issues takes time. For example, the Riverside County (Calif.) Flood Control District deployed drones for the first time earlier this year by “starting small” with one consumer-level unit. Even so, officials began planning for implementation about two years ago, according to Claudio Padres, the district’s chief of design and construction.

OVERCOMING ORGANIZATIONAL AND STAFFING ISSUES

Another key decision involves whether drone operations will be centralized across multiple departments or operated within them. As with the go big/go small question, size and capacity

often are important factors in this decision.

In many small localities, a single person takes on drone operation as part of his or her work. In Sherman, Texas, the role fell on a community and support services manager; in one Virginia city a staffer in the IT department with an interest in the technology was the first to take on drone duties.

Conversely, some large departments are now creating their own drone divisions, similar in structure and approach to a K9 unit in law enforcement agencies. Others are dispersing the drones across divisions and departments instead of creating a standalone internal team. The North Carolina Department of Transportation (NCDOT), for example, focuses on “getting drones in the hands of those who can use them” in different divisions and supporting them through training, says Program Manager Basil Yap. Regardless of approach, it may still make sense

to identify opportunities to pool data, training and maintenance across departments.

However, it's important that drone programs begin with a single point of contact, says Yap. Public sector leaders often start by identifying early adopters, such as employees who own or fly drones as a hobby outside of work and providing them "with the tools and resources to prove out the concept internally," says Chen.

In fact, 28 percent of CDG survey respondents said employees of their department have provided personal drones for work use. However, keep in mind doing so may introduce liability issues; at least one statewide agency has banned the use of personal drones for this reason.

As programs scale, more formal staffing needs to be put into place, according to Durscher.

"Something that was once on the side becomes a full-time position, and that happens more quickly than people think," he says.

As departments and agencies become more proficient in using drones in emergency response incidents and other real-time scenarios, many have adopted as a best practice a two-person team — one to fly the drone, the other to monitor the live video or other data and, in the case of emergency public safety situations, funnel it to incident response leaders.

PUBLIC SECTOR LEADERS WHO WANT TO IMPLEMENT DRONE PROGRAMS NEED TO ADDRESS PUBLIC CONCERN S – IDEALLY BEFORE THE FIRST DRONE TAKES TO THE SKIES.

UNDERSTANDING THE POLICY ENVIRONMENT

It's vital for public sector leaders to understand and monitor ongoing changes in regulations and laws governing the use of drones and other UAVs. Federal and state regulations govern a range of issues, including where they can be flown, who can fly them and, in extreme cases, if they can be used at all.

Fortunately, the barrier to entry for governments is relatively low. Most agencies get started with certification under the FAA's Part 107 rule, which is essentially a "driver's license" for commercial drones that requires operators to pass a simple multiple-choice test. Under Part 107 rules, operators must avoid controlled airspaces such as airports and fly the drones during daylight within their visual line of sight and stay below 400 feet. For agencies that need more flexibility, the FAA offers another process — known as a Certification of Authorization (COA) — that allows for nighttime flying and other exceptions. The COA process is more involved than Part 107 certification, but many government agencies have used it successfully.

In addition, federal policy changes continue to expand

where and how government agencies can use drones. For instance, the FAA is testing a process called Low Altitude Authorization and Notification Capability (LAANC), which will give commercial drone operators easier access to controlled airspace near airports. LAANC will automate the process for approving low-altitude drone operations in controlled airspace, potentially giving commercial drone operators approval in near real-time. By late 2018, the FAA expects LAANC to be available at nearly 300 air traffic facilities covering approximately 500 airports.⁶

Along with federal regulations, state and local governments may have their own laws and regulations, which may — or may not — include exemptions for law enforcement or other public sector uses. There are currently nearly 200 state and local laws governing the use of drones, with nearly 300 more pending, according to the State Drone Law website.⁷ About half (45 percent) of CDG survey respondents said state laws or regulations restrict the use of drones, while 21 percent said that local laws do so. However, as with federal regulations, the picture is coming into clearer focus

as some states, like Virginia, pass laws limiting the abilities of cities and counties to pass their own laws or regulations limiting the use of drones.

GETTING BUY-IN

Public sector leaders who want to implement drone programs also need to address public concerns — ideally before the first drone takes to the skies. More than half of CDG survey respondents (65 percent) cited either the need for buy-in or public mistrust of the technology as key obstacles to adoption.

"There's a recognition that this is a technology associated with surveillance, even though the systems they're acquiring are ones you could find at Best Buy," Gettinger says.

Active community outreach is one key to winning public support. According to Gettinger, public safety agencies have done everything from publishing planned operating procedures and policies to collecting public comments as much as a year in advance of beginning a program, while other agencies have done little to engage the public. "It's really scattershot," he says.

Among the keys to public outreach is stressing the technology is not being used for blanket surveillance, but rather in targeted ways or during specific tactical situations or emergencies.

"A lot of departments focus on why they're using drones,

SOCIAL MEDIA AS A TOOL

To introduce its drone program, the Los Angeles County Sheriff's Department took to a different kind of airwave. In sharing the announcement of its unmanned aircraft system (UAS) program with as broad an audience as possible with a televised press conference shown on YouTube, the department used the following strategies:

DIRECTLY ADDRESSING PRIVACY CONCERNs.

"The UAS will not be used to spy on the public," Sheriff Jim McDonnell said emphatically, noting that the department's policy specifically prohibits random surveillance.

CLEARLY DESCRIBING USE CASES.

McDonnell cited the 600 suspicious and unattended package calls, 125 HazMat calls, 500 fire investigations and 500 search-and-rescue missions his department responds to each year.

SHOWING, NOT TELLING.

A video of the UAS, clearly marked with the department's star and the word RESCUE on its side, showed the public what the drone looks like — and, importantly, what it can see.

EMPHASIZING THE SAFETY OF LAW ENFORCEMENT OFFICERS AND THE PUBLIC.

"The dangers of law enforcement can never be eliminated," McDonnell said. "However, this technology can assist us in reducing the impact of risks on personnel and allow us to perform operations to enhance public safety."

Beyond introductions, many agencies routinely share drone video on social media channels such as YouTube and Instagram. In Modesto, Calif., for example, the police and fire departments created a dedicated Instagram account to showcase specific examples of the drones in use, such as spotting a suspect in a backyard to protect members of a SWAT team from harm, as well as footage of officers using the technology and the drones themselves to help put a face to both. Other public safety agencies share information about specific events in which drones are used in much the same way they do with manned helicopters.

but they're not really talking about where they're not going to use drones," says Durscher. "If you're not pointing that out, you're leaving a huge gap that leads to concern."

Doing so requires thinking through a broad range of policies governing drone use — the whens, whys and hows — and explicitly addressing privacy concerns. For example, the Riverside County Flood Control District's agency-wide policy covers compliance, safety and privacy. It was developed by staff who evaluated different regulations and identified potential risk areas, according to Padres.

And while law enforcement draws the most public attention, other government use cases also can lead to privacy considerations which must be considered and shared with the public. For example, the private contractor used by a Louisiana parish to conduct aerial surveying for mosquito control only searches the yards of abandoned homes or private property where the owner has granted permission. In Riverside, agency staff make a point of answering questions when members of the public raise them while observing drone operations, Padres says.

Social media can be a powerful tool in public outreach (see "Social Media as a Tool" on page 15). Other agencies bring drones to community events so the public can see them in action.

"WHEN YOU START A NEW PROGRAM, THE TENDENCY IS TO ALWAYS GO BIG, ESPECIALLY WHEN BUDGET IS AVAILABLE. THIS USUALLY LEADS TO A LOT OF FRUSTRATION. ... GET SOME WINS, AND THEN SCALE UP."

— ROMEO DURSCHER, Director of Public Safety Integration, DJI

It's also important not to neglect the value of internal case-making. For example, Sherman city officials used a variety of drone video during budget meetings that won funding for a replacement to its first-ever drone.

"We can demonstrate both to the council and to the public in a way we never could before what is exactly going on in the city, what their tax dollars are being used for and what the plans are for the city's future," the city's drone operator said at the time.⁸

UNDERSTANDING PROCUREMENT ISSUES

As drone technology grows more powerful and becomes more accessible, procurement is becoming more complex. Size and lift capacity, flight time, payloads, password locks, anti-collision technology and tagging features to help locate lost or damaged drones are just some of the capabilities that agencies and departments must consider when planning drone purchases.

"The conversation about the types of drones has become more sophisticated," Bard College's Gettinger says.

As prices of platforms have come down, the availability and cost of payloads has gone up.

"Some sensors can cost as much as the airframe itself," Gettinger says. "It's a costly investment, but a valuable one."

While consumer-level drones now meet many use cases, off-the-shelf products may not be appropriate for extreme or potentially hazardous situations. Without being hardened to meet specific use cases, some entry-level drones are not dust or water-resistant, or they may lack the safeguards needed to fly near high-voltage power lines. Others may lack a secure common data link (CDL) between the drone and its operator, though this can be addressed by software and hardware add-ons in many cases. And some specific use cases, such as surveying, require specific levels of positional accuracy.

Procurement strategies vary; the National Association of State Procurement Officials (NASPO) provides guidance on key issues to consider (see "NASPO Guidance on RFPs"). A growing

number of agencies are bundling drones with similar technologies, such as body cameras and other recording equipment, in budget requests and RFPs.

"For a lot of public service agencies, a drone is just another sensor or camera in the sky," says Chen.

In CDG's survey of public sector officials, camera payloads, including the quality of video, thermal or night vision imagery, and the potential to transmit video in real time, were the most important features, vastly outranking concerns about size, portability, and other payload options and capacity. (Not surprisingly, night and thermal vision capabilities were particularly valued by public safety, corrections and fire departments.) Only two critical platform features — range and durability — came close in the survey.

Starting small can help clarify specific technology needs, according to Durscher.

"Once you have missions under your belt, you get a much better feel on what you need," he says. "Get some wins, and then scale up."

It's important not to let acquisitions outpace capacity, Durscher adds.

"When you start a new program, the tendency is always to go big, especially

when budget is available. That usually leads to a lot of frustration," he says.

MEETING TRAINING NEEDS

A key challenge is the lack of national standards to ensure all drone operators receive the same meaningful training. However, at a minimum, drone pilots need to be FAA certified and know the basics of operating their specific equipment. A growing number of public sector organizations and private companies offer training programs to help departments get off the ground. Larger agencies are developing their own training programs, at times using a train-the-trainer model.

The biggest takeaway from public sector leaders and experts? Focus on tactics, not just the regulations. Many, if not all, training programs focus on the nuts and bolts of operating a drone and receiving FAA certification, but it's also vital that staff are trained on tactics that fit their specific use case — whether it's conducting a search and rescue operation or capturing aerial imagery for surveying.

It's also important to provide training that helps staff become more skilled with specific use cases and more competent pilots. At NCDOT, for example, the emphasis has been on creating a "culture of safety" through internal training that goes above and beyond FAA requirements, according to Yap.



NASPO GUIDANCE ON RFPs

Buying lead times are short, and most units are delivered "ready to fly."

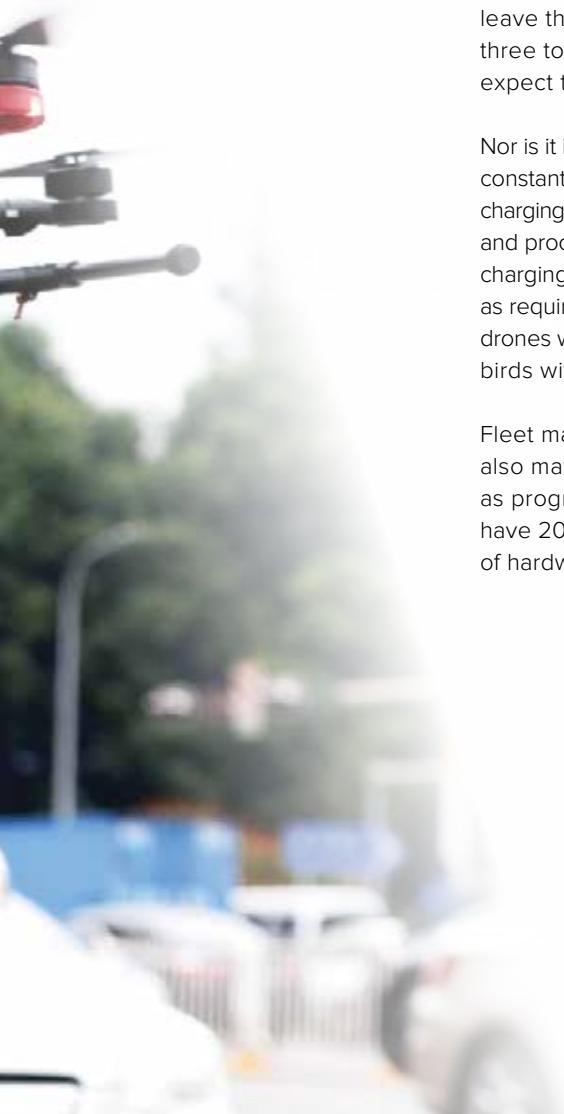
- ▶ **RFPs should include a detailed explanation for the application, type and quantity needed, desired timelines for delivery, and performance and quality specifications.**
- ▶ **Consider safety and security features, including running lights, anti-collision technology, cybersecurity and training.**
- ▶ **Consider the quantity and compatibility of extra battery packs and spare components.**
- ▶ **Determine whether vendors bundle training, maintenance, repair, warranties and other value-added services.**
- ▶ **Scrutinize camera quality to ensure it meets the requirements of the intended tasks.**

Source: NASPO¹⁰

ONGOING NEEDS

Once a drone program is up and running, departments and agencies typically find a range of new uses for the technology. Public safety agencies, for example, frequently evolve from use during incidents to preventative measures, such as fire and flood prevention, while other departments find new opportunities aligned with their mission.





For example, NCDOT began using drones in 2014, and as its fleet has grown to 15 UAVs in the subsequent years, use cases have expanded from ongoing documentation of construction sites to aerial pesticide applications in difficult-to-reach areas and highway collision scene reconstruction to reduce the amount of time roadways are closed to traffic, according to Yap. Regardless of use case, the ongoing operation of a drone

WHEN AERIAL IMAGERY IS COMBINED WITH OTHER GOVERNMENT ASSETS, SUCH AS GIS, THE POTENTIAL FOR COLLABORATION INCREASES EXPONENTIALLY.

program brings with it needs that cannot be overlooked. Among them:

MAINTENANCE

Propellers and batteries require regular inspection and replacement. Batteries also can pose other challenges.

“People charge them up, leave them in a hot car for three to four weeks, and expect them to fly,” says Bryl.

Nor is it ideal to leave drones constantly plugged in and charging, he adds. Create routines and procedures that govern both charging and regular use, such as requiring operators to fly their drones weekly. “You can kill two birds with one stone,” Bryl says.

Fleet management software also may become helpful as programs scale. “If you have 20 to 30 loose pieces of hardware for a handful

of drones, you can manage that on an Excel spreadsheet,” says Chen. “But as you grow, the hardware needs and software updates can bog departments down. How do you keep track of potentially hundreds of pieces of hardware once you have a UAV program in place?”

DATA STORAGE AND INTEGRATION

The video, imagery and other data collected by drones requires storage space, workflows and policies. A department may start by backing up material to an external hard drive, but it doesn’t take long for data volume to evolve beyond that. “Now you’ve got a backend data requirement,” says Couto.

WITH THE ADVENT OF OFFICER-WORN BODY CAMERAS, MANY LAW ENFORCEMENT AGENCIES HAVE A HEAD START ON THE KINDS OF DATA RETENTION AND PRIVACY ISSUES THAT COME WITH GROWING AMOUNTS OF STILL AND VIDEO IMAGERY.

Fortunately, with the advent of officer-worn body cameras, many law enforcement agencies have a head start on the kinds of data retention and privacy issues that come with growing amounts of still and video imagery. At the same time, there are differences in the data chain of custody that may require closer scrutiny.

Unlike body cameras, which are sealed and tamper-resistant, drone footage and other data may require more manual collection practices, according to Chen. But greater amounts of data mean greater opportunities for integration. When aerial imagery is combined with other government assets, such as GIS, the potential for collaboration increases exponentially.

"The reality is the drone itself is only the tool — it's a data collection device," says Durscher. "What's valuable is the data."

And as with all data, agencies will need to develop policies on retention, privacy, and the sharing of information across departments and with other organizations and the public. Data standards across departments also will become more critical,

particularly if different departments work together.

"There's not one perfect solution, but it's something that needs to be thought through on a city level," Durscher says.

MANAGEMENT AND DETECTION

As drone adoption increases, another emerging issue involves managing multiple drones operating in the same airspace, particularly during widespread emergencies such as a wildfire or the aftermath of a natural disaster. Following Hurricane Harvey, for example, insurance companies, telecommunications providers and public safety agencies all had drones in the air in and around Houston conducting inspections.

UAV detection software and platforms can be used to track multiple drones, as well as identify and detect non-government drones to prevent risks to public safety, such as when hobbyists — or potential bad actors — fly their own drones too closely to active law enforcement operations or secure sites such as airports or critical infrastructure.

UAV detection can also serve as a miniature control tower for

larger missions when disparate teams are operating multiple drones in the same area, such as when first responders and other emergency personnel are responding to a natural disaster. In addition, the FAA is working on remote identification requirements for drones to improve the management of airspace in these situations.

ONGOING TRAINING AND SUPPORT

Even after agencies comply with FAA requirements to certify drone operators, training isn't a one-and-done issue. As additional departments within a locality begin their own drone operations using different platforms and payloads, maintenance staff and operators need to stay apprised.

One solution is to pool resources for training and recertification. Another is to create cross-departmental user groups to improve informal information sharing and problem-solving, according to CDG's McKinney.

To ensure sustainable financial support for drone programs, it's also vital to compile examples of flight logs and show how they are used to make a case for their importance, according to Yap.



THE FUTURE

Beyond the present-day challenges, exciting opportunities exist as both drone technology and the public sector's use of UAVs continue to evolve.

More sophisticated and specialized payloads are coming on the market, and the drones themselves are at once getting bigger and smaller. Larger drones with greater lift capacity could someday dump flame retardants on wildfires, or even carry people to safety. Smaller, backpack-carried drones already are used in challenging and dangerous scenarios, such as indoor active shooter situations.

Artificial intelligence will increasingly be brought to bear on analyzing the data coming from drones. New predictive use cases will emerge, such as identifying changes in ground cover that could lead to wildfires or creating search and rescue flight patterns optimized in real time to specific terrain. It's worth noting that considerable venture

capital in the space is now shifting to the software side. Ultimately, AI will drive the next generation of fully autonomous drones, which, as regulations evolve, will enable completely new use cases and increase the value of current-day technology. For example, the city of Louisville wants to incorporate self-routing drones into its existing gunshot-detection system to improve police response time and eliminate false positives.¹¹

"Once [regulations have] caught up, the technology will once again step dramatically forward," Durscher says.

And as regulations are beginning to coalesce at the national level, standards will likely follow. The International Standards Organization (ISO) and others are working to develop common standards for UAVs covering a range of issues, from the technical (classification and design) to the tactical (operational and management procedures, maintenance and safety). A particular area of concern

involves training, which, beyond the FAA's basic requirements for certification, lack common standards for what drone operators in public safety use cases need to know and be able to do. This is particularly apparent in search and rescue, where research needs to be done to identify best practices and inform training.

At the same time, public sector leaders must be aware that as drones and their uses become more commonplace, so will the need to keep their constituents informed.

"Aside from a few larger cities, we haven't seen a lot of public pushback against drones," says Bard College's Gettinger, "but that could change as more complex types of operations and more advanced technologies are involved."

One thing, however, is certain. "This isn't something that's here today and gone tomorrow," says Bryl. "It's something that's going to be an integral part of [business] from here on out."

ENDNOTES

1. <http://www.heralddemocrat.com/news/20180627/flying-high>
2. The Center for Digital Government surveyed state and local public sector leaders in June 2018, garnering responses from 219 qualified respondents. Survey participants primarily represented local government agencies (45 percent from cities or municipalities and 24 percent from county governments), followed by county agencies (21 percent), state-level departments (21 percent) and special districts (8 percent). As with the use cases, the majority of respondents represented public safety agencies (37 percent public safety, 11 percent fire, 3 percent corrections, 3 percent emergency management departments), followed by transportation departments (15 percent), agricultural/environmental agencies (8 percent), utilities (7 percent), planning departments (5 percent), public works (2 percent), technology (1 percent). Other departments represented 7 percent of respondents.
3. <http://dronecenter.bard.edu/public-safety-drones-update/>
4. <http://magazine.nvtc.org/2018/06/look-to-the-skies/>
5. See Durscher's study on European agencies at <https://www.dji.com/newsroom/news/dji-and-eena-release-white-paper-sharing-insights-for-improving-emergency-response-with-drones-in-first-responder-scenarios>
6. https://www.faa.gov/uas/programs_partnerships/uas_data_exchange/
7. <http://statedronelaw.com/>
8. <http://www.heralddemocrat.com/news/20180627/flying-high>
9. <https://www.youtube.com/watch?v=UITVZu2dXQk>
10. <http://www.naspo.org/Portals/16/Whitepapers/Tech-Next-Drones-FINAL.pdf>
11. <http://www.govtech.com/Louisville-Plans-to-Become-First-US-City-to-Use-Drones-to-Respond-to-Gunshots.html>

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