Five Valuable Business Lessons Learned About Drones in Public Safety and First Responder Operations

More recent (and better) data points show what works and what doesn’t for police, fire, emergency response, and search & rescue

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This is the fifth in a new series of Drone Analyst white papers intended to share lessons learned within specific industries. These reports will help you as a business owner in those industries maximize the value that drones can deliver. This year we are building on the analysis we did for the 2016 “Truth About” papers by incorporating real-world experience gained from public agencies and drone pilots operating under the Federal Aviation Administration’s Small Unmanned Aircraft (UAS) Regulations (aka FAA Part 107). As of March 31, 2017, FAA data indicates there are more than 39,000 drone operators certified under Part 107 and 61,000 commercial drones registered in the U.S.

Introduction

There are good reasons to use drones in public safety and first responder operations. The main idea is, Why not send unmanned aerial vehicles into high-risk or remote emergency situations before putting first responders at risk while helping victims more efficiently? Drones have already been used in this context. As early as 2008, the Mesa County Sheriff’s office in Colorado embraced domestic police drones. Since then, they’ve done everything from help locate missing people to assist firefighters by surveying burning buildings. In 2013, a Royal Canadian Mounted Police officer used a quadcopter with an infrared camera to find an injured person after his car flipped over in the snow in Saskatchewan. Ventura County Sheriff’s Office of California was also one of the first to use drones in the U.S. for law enforcement and public safety. In 2013, they evaluated limited operations within a restricted unpopulated area for training and evaluation purposes only.

Back in the early days, visionaries knew that drones could be used for a wide array of activities. Turns out these visionaries have found in unmanned aerial vehicles, otherwise known as UAVs, an invaluable response tool. As we detailed in The Truth About Drones in Public Safety and First Responder Operations, small drones have helped many agencies find cheaper and safer ways to help out in everything from critical incidents, to crime scene documentation, to search and rescue operations. A drone, with the relevant sensors and software, is an excellent tool for such roles—it provides a low-altitude perspective and captures high resolution data. It’s no wonder a rising number of cities, towns, and municipalities are starting to use drones.

So what have police, fire, and emergency responders learned about what works and what doesn’t? What have the early adopters learned about operating their drones? And where do we go and what can we expect in the future?
LESSON 1
You need a license to fly a drone for public agency purposes, but it’s not complex

In the past, U.S. public agencies were required to obtain a specific exemption known as a Certificate of Waiver or Authorization (COA) to fly and operate drones. These exemptions were complex and took a great deal of time and legal expertise to obtain. But that all changed beginning August 29, 2016, when the small UAS Rule took effect. The new rule says operators have to obtain a remote pilot certificate with a small UAS rating. Under this rule—also known as Part 107—the person actually flying the drone must have this certificate or be directly supervised by someone who does. Even with the new rule you still may be required to apply for a COA for certain operations (like those using a public aircraft), but the simpler option covers most use cases.

Licensing educates operators on important issues such as airspace, flying within line of sight, and other topics that promote safe flying habits. The good news is that it’s not difficult to obtain that license. The process is outlined by aviation attorney and commercial pilot instructor Jonathan Rupprecht here. Additionally, the FAA has published the Remote Pilot—Small Unmanned Aircraft Systems (sUAS) Study Guide to communicate the knowledge areas you need to study to prepare for taking the test to earn a Remote Pilot Certificate.

ACTION: Determine who in your organization needs to be licensed and have them start studying. Resources abound, like this Part 107 test study guide. This particular guide has the material the FAA suggests you study and also includes essential material they left out. Once you understand what the rules are, make a business plan for operations under Part 107. Go back and skim over the Part 107 Summary and read about Part 107 waivers (COAs) and determine if you need to perform non-107 types of operations such as flying at night or beyond visual line of sight.

LESSON 2
Determine the application before purchasing a drone

According to an April 2017 report by the Center for the Study of the Drone at Bard College, at least 347 state and local police, sheriff, fire, and emergency units in the United States have acquired drones. We suspect that actual numbers are higher since there are over 200 police agencies with manned aviation divisions alone, and most of those agencies now use drones. We also believe that number is higher because since August 2016 (when the new rule kicked in), the momentum of prosumer drones sales intended for public agency use picked up rapidly. This increase is due largely to the fact that drones and drone training can now be purchased using federal or state funds the same way other federal and state funds are used for fire and police equipment and for training for everything else that’s tied to federal regulations.

According to veteran search and rescue and disaster response trainer Gene Robinson of Drone Pilot, Inc., the number one problem is that many agencies make the mistake of going out and buying the first bright and shiny drone that takes a picture. They never look at the drone aircraft capabilities or, more important, they never look at what their mission requirements were going to be (or could be as allowable by local law) and then match those two.

The classic example of this mistake is the agency that tasked a person who was an RC pilot that flew every Sunday and then sent him on a mission to do reconnaissance over a fire. It was only after he lost the drone in a flyaway because it got caught in a heat flume that the agency went back to square one, defined the scope of their drone program, and engaged some training (more on that below). The other example comes from Indiana where the two largest police departments that wanted drones picked missions that were not allowable by law. One wanted drones for crowd surveillance at major gatherings.

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downtown, the other wanted to monitor traffic at events such as the Indiana State Fair. Unfortunately, both uses appeared to be against the law in Indiana.

In November 2016 drone manufacturer DJI, in partnership with European Emergency Number Association (EENA), released a white paper sharing insights and best practices from a year-long project with the European emergency response community. The main goal of this project was to get a more detailed understanding of the needs of first responders and how off-the-shelf platforms could meet those needs. But the project challenged the teams to identify best practices over the course of the project in five areas, including:

1. Integration of drones into Standard Operating Procedures (SOP)
2. Training of outside teams on the use of drones
3. Hardware needs maintenance
4. Logistics (storage and transportation to the incident site)
5. Educating regulators and the public

The team concluded you should have a minimum of two people using the drone, with one person controlling the aircraft and one person monitoring the video feed. They also concluded that, when considering hardware, you should make sure the platforms are reliable and have redundant systems.

**ACTION:** Keep in mind the most expensive drone may not be the best fit for you. When evaluating drone solutions, you need to ask the question, what capabilities do I need to meet our mission requirements? If you don’t have a list of mission requirements, then start with a narrow scope of operations. Gene recommends you treat drones as a response tool—not a patrol tool—and pick from a list of four operations that your constituents would find most palatable. These are search and rescue, pursuit of an armed suspect, critical infrastructure support, and disaster mitigation.

**LESSON 3**

Training is multifaceted and should not be an afterthought

We alluded to this above. Buying a drone and training go hand-in-hand. DJI Director of Education Romeo Durscher recommends thorough training on several topics. This includes basic training—as in Part 107 pilot training and “stick time” on the controls of your aircraft of choice—and advanced training for tactical use, e.g., learning the best way to manage the drone before, during, and after deployment.

Gene Robinson (and the Drone Pilot training team) include these and add additional layers of training gleaned from his years of experience as head of Unmanned Aircraft Operations for the Wimberley Fire Department. Some of those experiences and lessons learned are outlined in a white paper on the 2015 Texas Memorial Day flood. That paper reports that drones—and at one point 16 manned aircraft—were used for disaster relief for multiple days, but not without problems. Problems included multiple rogue manned and unmanned aircraft being operated within the temporary flight restriction, the loss of communication abilities via cell, the line-of-sight problems with handheld aviation radios, and the inability to request FAA approval to operate in the area.

**ACTION:** Find a comprehensive training program that will involve all stakeholders—not just the ones on the immediate drone team. Courseware should include proper aviation training with both class time and flight time.
It’s best to be transparent about your activities

As this Saint Leo poll finds, public sentiment about drones is mixed. While the public is more aware about drones in general, they are still unsure about what they should be used for and the potential risk from widespread adoption. People are concerned about drones because of potential interference with passenger airplanes—a much hyped and often over-reported issue—and privacy issues. On the other hand, nearly three quarters (72%) of people polled thought that drones were great for use by local police forces. And while that may sound like good news, you would be remiss if you thought it’s smooth sailing for agencies to initiate a drone program. The devil is in the details.

The general public is still very concerned about privacy. As this Slate article states:

“Drones embody surveillance. They provide a visual and sometimes physical target for privacy fears. Drones have catalyzed state privacy lawmaking and prompted numerous conversations about coming privacy concerns. Intriguingly, however, the driving drone privacy narrative hasn’t been about location tracking, or pervasive government surveillance. It’s been about sunbathing young women.”

The article goes on to point out that drones are one of many technologies that don’t disclose how much they’re capturing. In 2001, the Supreme Court found police use of a thermal-imaging device violated the Fourth Amendment because it “might disclose, for example, at what hour each night the lady of the house takes her daily sauna and bath.”

So, wisdom says the last thing you want to do is create public outcry of invasion of privacy when there is none. The best way to combat this is with flight logs. These are essential to proving who flew what where and can prove or disprove a suspected surveillance.

**ACTION:** A drone program should both train and involve your city, county, school district, state government, and police/fire departments Public Information Officers (PIOs). Use them as your allies to keep the public informed about actual or potential use. Keep details flight logs to capture takeoff point, flight path, altitude, and landing location and if possible publish these to the web.

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**LESSON 5**

Your best ally may be the GIS department

Sometimes drone work requires an image processing technique called photogrammetry. Examples of this in public safety and first responder operations include:

- Crime scene documentation and investigation
- Traffic accident scene documentation and investigation
- Post-fire documentation and investigation
- Post-disaster reconnaissance

Photogrammetry uses photography to extract measurements of the environment. This is achieved through overlapping imagery, where the same feature can be seen from two perspectives. With photogrammetry, it is possible to calculate distance and volume measurements. Experts use these outputs to create “point clouds” or 3D images for rendering building or structure images.

Photogrammetry may be new to your agency, but chance are it’s not new to your city, county, or state government’s geographic information system (GIS) department. Typically...
these departments provide mapping and information services so others can visualize, question, analyze, and interpret data to understand relationships, patterns, and trends.

Software and hardware advancements in recent years have given us the ability to do photogrammetry on a laptop or with an online drone data service—and it looks really easy. But there is catch—accuracy. Issues affecting a UAS’s accuracy of data capture include:

- the camera’s inherent accuracy
- the stability of the flight
- the quality of the GPS data
- the type and quality of processing of the raw imagery
- the number and quality of ground control points

**ACTION:** To understand the issues of accuracy, read *Just How Accurate is Your Drone?* Even better, be certain your GIS department has already grappled with these issues and can recommend best practices for accuracy and aerial image capture. In any case we recommend whoever is performing the operations listed above get training and certification from the American Society for Photogrammetry and Remote Sensing (ASPRS).

**What’s next?**

Drone manufacturers and Moore’s Law are both hard at work—making things faster, lighter, and cheaper. At Skylogic Research, we are tracking the development of new sensor technology. That technology is progressing rapidly in drones and aerial imaging processing—more rapidly and at lower costs than manned-based aviation solutions.

One of the most exciting developments for police, fire, emergency response, and search & rescue departments is computer vision drones. Nearly every week there is a new announcement for a new product. For example, Netherlands-based Aerialtronics just announced a fully integrated computer vision platform that integrates a powerful thermal infrared camera with a 30x zoom Sony daylight camera. This platform could dramatically change the way operators perform aerial tasks in search and rescue, disaster relief, and documenting fires. Future capabilities include ability to process filtered data of interest into geo-referenced reports and push real-time notifications. This has the potential to accelerate the workflows of public safety and first responder operations.

Keep your eye on this space for more innovations.

That’s our look at the valuable business lessons learned since Part 107 went into effect. There are plenty of opportunities for police, fire, emergency response, and search and rescue teams to use drones in every phase of their response operations. Those that do will save time, get results, and improve public relationships.

**ABOUT SKYLOGIC RESEARCH**

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