

FIRE RESCUE 1



OFF THE GROUND

LAUNCHING A FIRE DEPARTMENT
DRONE DEPLOYMENT PROGRAM





EDITOR'S NOTE

Drones are increasingly sought-after tech tools for fire departments looking to expand their response capabilities. In the same way SCBA and thermal imaging cameras were game-changers for the fire service, these unmanned aerial vehicles (UAVs) are also revolutionizing many aspects of firefighters' work.

There are myriad use cases for unmanned aerial systems (UAS). From assisting on search and rescue missions to capturing an aerial view of wildfire progression, drones provide fire service personnel with an unprecedented view of an incident scene.

The biggest advantage to UAS in the fire service is the ability to go where firefighters cannot. Consider surveying the scene at hazmat calls or natural disasters sites, or even getting a better view of a complex structure fire where access is limited. The technology can fundamentally change how fire departments respond to a wide range of incidents.

As the technology improves and its applications expand, the relatively low cost of drones means agencies of all sizes can use them. For larger departments, a drone is an essential addition to

an air unit. For smaller agencies, drones provide an airborne asset that was previously financially out of reach.

As departments continue to adopt this technology, the members charged with managing drone programs can find themselves wondering where to begin.

The articles in this eBook serve as a guide to the initial steps a fire department should take when looking to add a drone to its arsenal of tools. It details what firefighters need to know about how drones can be deployed in the field. It also outlines how to develop a successful drone program and how to overcome common challenges associated with getting these programs off the ground.

I encourage you to read and share this eBook with your members. Discuss how you would use drones in the field and how that would impact firefighter safety. Then consider the next steps to implement a drone program to add some needed "eyes in the sky" to your response.

Janelle Foskett
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TABLE OF CONTENTS

4

Eyes in the sky: How firefighters can use drones during all-hazards incidents

By Anthony Tisdall and Bear Afkhami

8

4 steps to a successful drone program for your fire department

By Jim Spell

12

How to overcome the challenges of starting a public safety drone program

By Wayne Baker



A thermal image showing a person in a forest. The person is highlighted in a bright yellow and orange color, indicating a heat signature. The surrounding forest is in shades of blue and purple, representing cooler temperatures. The person is standing with their arms slightly out to the sides.

EYES IN THE SKY:

HOW FIREFIGHTERS CAN USE DRONES DURING ALL-HAZARDS INCIDENTS

Drones are able to identify heat signatures of victims during search and rescue missions. (Photos/DJI)



Reviewing the sUAS tactical and strategic applications on at fire and emergency scenes

By Anthony Tisdall and Bear Afkhami

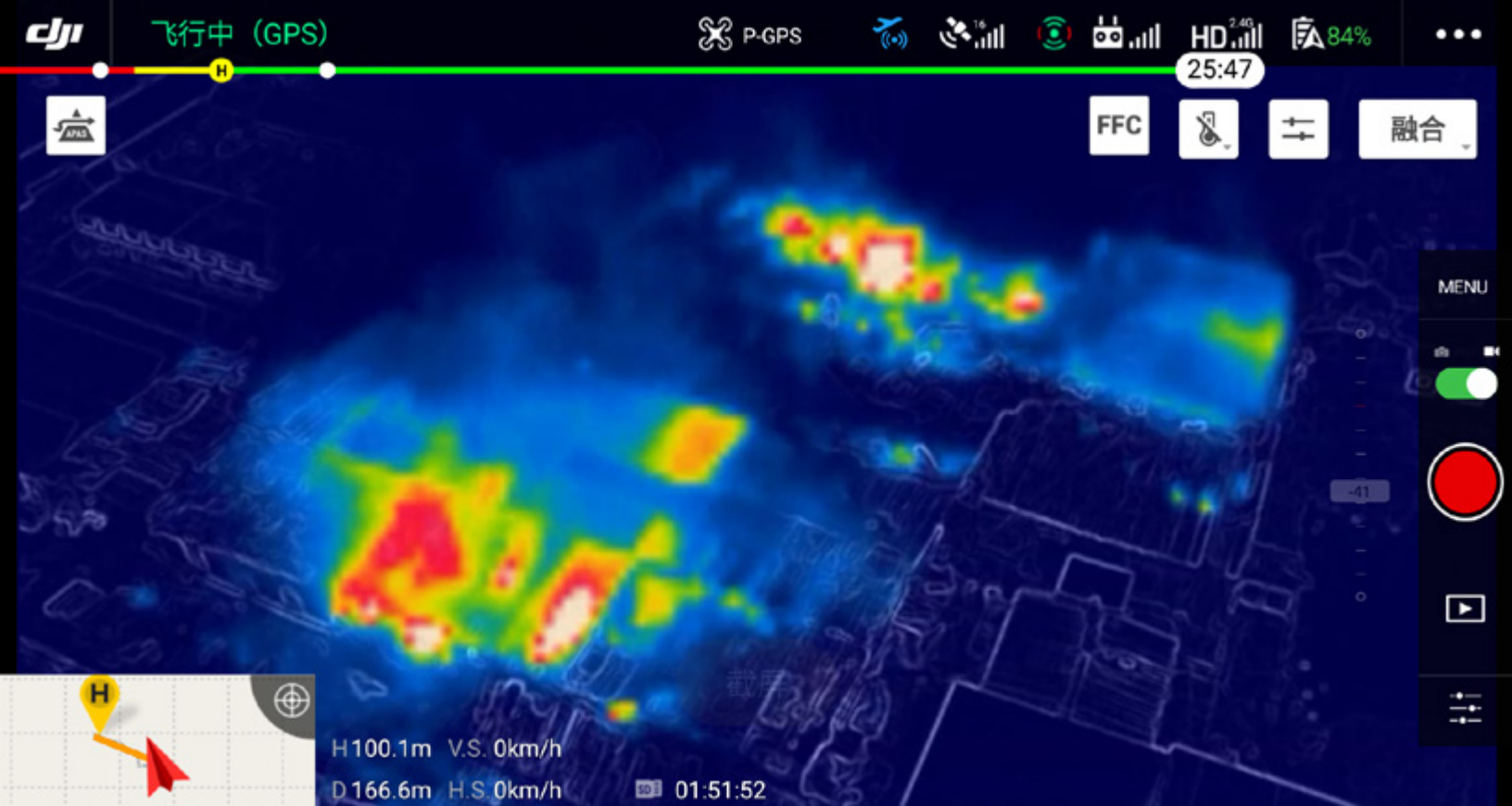
More and more fire bays across the country are starting to make room for possibly the lightest piece of apparatus in terms of weight, but perhaps heaviest in terms of regulations. There are numerous applications for [drones, or small unmanned aircraft systems \(sUAS\)](#), during fire/rescue operations, once the hurdles of setting up a responsible program are overcome.

TACTICAL AND STRATEGIC USE OF DRONES

Fire/rescue leaders should think of an sUAS as an intelligence, surveillance and reconnaissance tool with the ability to provide command officers and emergency operations centers (EOCs) information that was previously either unavailable or extremely difficult to obtain in a safe and timely manner.

The tools, including accessories, of sUAS deployed within fire/rescue operations include [more than a simple “eye in the sky” aid](#), and expand to four primary tactical and strategic cases:

1. Real-time unfiltered visual observation: This type of observation can be transmitted to either unit officers at the incident, command officers in the field or stakeholders, such as command officers, PIOs, political staff, etc., at an activated EOC.
2. Thermal imaging: The latest field within the intelligence community to be developed includes the usage of measurements and signatures intelligence (MASINT).



Drone-based thermal imaging can assist in determining which structure quadrants have the hottest heat signatures and what, if any, extensions exist.

3. **Recording:** The ability of post-event investigators and training officers to review incident response history is an invaluable tool. Recordings can be used to evaluate and teach best practices in a way that has not been available before.
4. **Logistics:** sUAS are increasingly becoming a tool for transporting small objects from one point to another, saving time and entering harder-to-reach places.

DRONE APPLICATIONS BY EVENT TYPE

With technologies becoming more efficient and less expensive, the [application of sUAS](#) has grown for urban, rural, suburban and wildland fire/rescue.

Structural fires: As units arrive on the scene of a structural fire, a command officer or command officer assistant can prep and launch an sUAS directly from the command vehicle. The sUAS would take flight to capture standard imagery in order to more fully and quickly perform a scene

size-up of all exposures, quadrants and sides. The flight can also include thermal imaging analysis of the structural integrity of the roof quickly prior to crews deploying to ventilate. Thermal imaging also can assist in determining which quadrants have the hottest heat signatures and what, if any, extensions exist. With all this intelligence, attack lines can more accurately be deployed.

Brush fires: The containment of brush fires can be made more efficient with the deployment of an sUAS. An aircraft can more quickly and fully provide an assessment of longer ranges and more hostile conditions, without the need to commit firefighters as observers. Instead, fire crews can use the intelligence gathered to prepare containment perimeters and attack lines.

Search and rescue: The deployment of sUAS to assist in search and rescue operations provides a fundamental benefit to life safety. As mentioned previously, sUAS can go where

humans cannot or can do so faster. In addition, air operations can identify heat signatures of victims, making it particularly beneficial in situations where the victim is in an unresponsive or incapacitated state.

Mass casualty: Scene size-up is critical at a mass casualty event. An sUAS can help where resources need to be both initially and continuously determined in the most efficient manner. A broader panoramic initial assessment can be made using sUAS, and the aircraft can hover in order to provide repeated assessments. The recording can be performed for post-incident analysis as well as training for future events.

Hazmat: Incidents involving hazardous materials require a delicate balance between prioritizing responder safety and response to the incident. Without exposure to the responder, an sUAS can safely provide the reading of placards, identification of substances and determination of downwind/downstream/downhill directions. Not only will an sUAS be deployed to hot, warm and cold zones, but it can provide multiple measurements and signatures readings. These readings include basics such as CO2 to more immediately dangerous gases, liquids, corrosives, etc.

Post-event analysis: Post-fire or hazmat investigations can benefit from an eye-in-the-sky view of damage assessments, and investigators can use the recordings of the actual incident to assist in their efforts.

DRONE BENEFITS

When it comes to safety, sUAS offers can capture intelligence, with reduced exposure for first responders. When launched, an sUAS can establish unsafe zones and parameters for rescuers to avoid. For example, this includes the ability to quickly inform the tower crew on the way to a roof that the structural integrity of the roof could lead to collapse.

Drones help with efficiency related to determining the best methods of approach to different incident responses. For example, an sUAS can be deployed over a structural or wildland fire and begin producing intelligence within minutes.

As cost savings are concerned, the deployment and capability of one sUAS for intelligence-gathering purposes can equal the observation capabilities of several responders deployed on foot or on apparatus. This saves jurisdictions money by distributing resources more efficiently. Not having to place responders in hostile conditions without adequate intelligence also saves jurisdictions money in health and benefits costs.

As drones become more commonplace in the fire service, it is important for fire/rescue leaders to evaluate how drones could fit into their equipment cache for emergency responses. ■

About the authors

Tony Tisdall has over 35 years of experience in air traffic control and air traffic flow management and has served as an air traffic manager at the FAA's Air Traffic Control System Command Center (ATCSCC) in Warrenton, Virginia. He is currently vice president of global affairs and aviation solutions at JMA Solutions, an FAA contractor.

Bear Afkhami has over 10 years of service in the emergency services sector in numerous fire service, continuity of operations plan (COOP), military and intelligence roles. Afkhami is currently a capture manager at JMA Solutions and serves as a partnership chair for InfraGard Maryland, an FBI-private sector partnership to protect critical infrastructure.

Tisdall and Afkhami lead JMA Labs' sUAS and UAS Traffic Management (UTM) Initiative to promote the safe implementation and management of sUAS within critical infrastructure sectors.



4

STEPS TO A SUCCESSFUL DRONE PROGRAM FOR YOUR FIRE DEPARTMENT

Establish your department's needs and budget, and learn from other departments and how FirstNet can improve your emergency communications to get your first UAV in flight

By Jim Spell

In today's fire service, it is essential for firefighters to understand the responsibility of implementing technology-driven resources. More importantly, it is critical for fire departments to recognize both the benefits and liabilities of embracing these advanced products and programs. Such is the case for [drones and their applications to firefighters' work and their departments](#).

Implementing unmanned aerial vehicle (UAV)/unmanned aerial system (UAS) programs requires pre-planning, extensive training and certification, as well as vast amounts of information regarding policies, procedures, products and services. Here are the basic steps in [creating an effective and responsible UAV/UAS program](#) for your fire department, the goal being to create solutions and not problems.



1 UNDERSTAND DEPARTMENT DRONE NEEDS

Are you part of a large metropolitan fire department capable of supporting an entire UAV division, or are you volunteering at a small rural collective soliciting funds from local businesses? Do you have seven months of winter or year-round heat waves followed by cataclysmic winds? Is your department challenged by high-rises in densely populated areas or large expanses of wilderness or desert?

Over and above department size and environment, [requirements for UAV use](#) may be influenced by:

- Call volume
- Nearby controlled airspace
- Local hazards
- Infrastructure
- Auto or mutual aid agreements

Whether driven by a large percentage of medical calls, search and rescues, wildland fires, [industrial hazmat threats](#) or building inspections, knowing the daily response demands of your department will dictate [the type of drone and payload requirements](#) that will best suit your department.

2 APPROVE A WORKABLE UAV BUDGET

Once you've determined mission requirements, you can formulate a financial plan to purchase equipment and maintain an appropriate UAV program. Such expenses over and above the drone and its components include:

- [Pilot or public use certifications](#)
- Application for government-approved waivers
- Documenting training and actual flights

Failure to read and abide by the numerous statutes, codes and restrictions regarding

remotely piloted aircraft incorporated in the Federal Aviation Administration's rules and regulations can bring about an immediate end to any UAV program regardless of intent or emergency.

Add to these expenses the funding for the numerous public safety policy costs encountered in flying over various jurisdictions and authorities, as well as all support services, including:

- Insurance
- Software updates
- Storage
- Deployment expenses
- Ongoing training with other response agencies
- New communication technologies

3 LEARN FROM OTHER FIRE DEPARTMENT DRONE PROGRAMS

Large fire departments, such as the Los Angeles, Phoenix and FDNY have entire divisions

devoted to deploying UAVs. Their standard operating procedures are publicly available, and understanding and utilizing information appropriate to your department's success is encouraged.

Smaller departments can share information and experience regarding UAV equipment, budget appropriate suppliers, and the exact expertise and training needed for particular mission requirements or deployment platforms. Modifying existing policy and procedures can accelerate drone programs and get a department's drone into the air faster and safer, saving substantial funds and keeping ahead of ever-changing technology.

4 APPLY FIRSTNET TO DRONE RESPONSE

If you have attended an incident debriefing, you know that communication issues quickly come to the forefront of concern and criticism. A lack of clear channels, intermittent connectivity, squelching and jurisdictional gapping contribute to the more than 10,000 individual and potentially mismatched radio networks tasked to communicate with each other during an emergency.





Drone communications are subject to the same issues. Inadequate data and a lack of real-time interface can result in threatened airspace, intermittent connectivity or unauthorized flights, especially during large-scale multi-agency incidents involving multiple jurisdictions. In worst-case scenarios, UAVs can destroy property and injure personnel.

To directly address these problems, a group of public safety officials in cooperation with Congress created a public/private partnership to build, operate and maintain a prioritized, secure, redundant, mobile and reliable broadband network known as FirstNet.

AT&T's FirstNet provides emergency responders with a nationwide, high-speed broadband channel solely dedicated to public safety, available by subscription in all 50 states, three territories and Washington, D.C., with a buildout schedule of 25 years.

Drones, like all fire department related equipment, benefit from utilization of FirstNet when and where available. One portable site provided FirstNet wireless service after Hurricane Maria hit Puerto Rico, utilizing connections generated by and for drones to link first responders and civilians in distress.

Mission-critical communication compatibility with FirstNet for UAVs depends on fixed site, vehicle and portable heavy-duty routers, towers

and amplifiers providing push-to-talk, proximity services, universal compatibility, and the secure exchange of essential data. These commercial connection devices must be certified and approved by FirstNet based on technical requirements and industry standards, and their ability to be utilized in and outside the FirstNet system.

Within the next decade, such advanced technology will guarantee a nationwide broadband network for all public safety agencies regardless of environment or incident location, as well as protected connections for all UAV operations. ■

About the author

Jim Spell spent 33 years as a professional firefighter with Vail (Colorado) Fire & Emergency Services, the last 20 years as a captain. He helped create the first student/resident fire science program west of the continental divide, formed the first countywide hazmat response unit and was on the original Colorado Governor's Safety Committee. As founder of **HAZPRO Consulting, LLC**, Spell advises businesses on subjects ranging from hazard analysis and safety response to personnel development and organization. His writing has won six IAFF Media Awards. Spell has an associate's degree in fire science and a bachelor's degree in communications. His articles are available by Podcast at Fairreachforum.com, and his latest book is "[Boot Basics: A Firefighter's Guide to the Service.](#)" Spell can be reached at editor@firerescue1.com.

HOW TO OVERCOME THE CHALLENGES OF STARTING A PUBLIC SAFETY DRONE PROGRAM



The Lynwood Fire Department shows the value of drones for small-to-mid-sized agencies

By Wayne Baker

In the fall of 2017, in Peru, Illinois, an armed suspect has barricaded himself inside a suburban home after firing at police officers. The apparent suspect's emotional instability, the fact that the suspect was former military with explosives experience and the threat he made of placing IEDs around the house are making the situation worse. Well over 150 public safety personnel surround the house. Fortunately for the tactical teams and emergency response crew, the suspect is willing to negotiate.

CALLING FOR HELP

As the day wore on, the incident commander knew that the coming night would only complicate the situation. He asked his team what options they had. Chief Ed Rogers of the Utica (Illinois) Fire Department immediately thought of the Lynwood (Illinois) Fire Department and its UAS operations program. Thermal imaging paired with a clear aerial view of the house would provide acute situational awareness in case the suspect made a run for it.

After receiving the call, Keenan Newton, lieutenant and UAS coordinator of the Lynwood Fire Department, arrived on site before dusk.

As he and his team began unloading their equipment, the suspect told the negotiator that his phone was low on battery. Negotiators knew they had to keep talking with the suspect to help ensure a peaceful outcome. It was a tense moment. Everyone anticipated the situation intensifying unless the suspect was provided a new phone. Something had to be done.

The first attempt to deliver a phone with a law enforcement robot failed, as it had a technical failure. The incident commander looked at Chief Rogers and asked if the phone could be delivered with a drone. "Of course we can, we're firemen," Chief Rogers responded.

Keenan got to work immediately. Utilizing a drop-release system, a remote-controlled drop mechanism used for deliveries, on a DJI M600 Pro drone, he would attempt to swing the phone into the suspect's bathroom window. Two Inspire 1 drones were flown nearby to help spot and guide the drop, as well as record the delivery. The cell phone was tied to a rope, and within minutes the drone was hovering over the house. Approaching carefully, Keenan successfully positioned the cell phone just outside of a window and swung it towards the bathroom window until the suspect grabbed it.

"I released it from the drone, and five hours later, he surrendered peacefully," Keenan said.

"I would call it a life-saving operation. Many incidents like this have escalated to the point of putting both suspects and officers were put at risk of lethal harm. Keeping lives safe and out of harm's way is one of the core value propositions of having drones on our fire department," Keenan added.

A HUMBLE BEGINNING

As successful as Keenan and the Lynwood Fire Department were that night, Fire Chief John Cobb was once skeptical of having a UAS

program. "At the time, I saw drones as more of a toy than a functional part of the fire service," he said.

However, a search and rescue incident occurring in December 2016 changed his mind. Two people in a vehicle ran off the road and into a retention pond. A witness nearby stopped his car and headed to a nearby bank. Before reaching the entrance, he peered back after hearing one of the passengers struggling to get out of the water, yelling for help for him and his friend.

The witness rushed to his car to call 911, but when he got back, the man was gone.

"I RELEASED THE PHONE FROM THE DRONE, AND FIVE HOURS LATER, HE SURRENDERED PEACEFULLY"

The Lynwood Fire Department responded immediately and requested dive teams and additional water rescue resources from surrounding communities. The city of Chicago sent out a helicopter to aid in the search. However, it had no luck and returned when it ran low on fuel. The fire chief then called Keenan.

Keenan arrived with his drone and launched it within minutes, picking up where the helicopter left off.

As the afternoon wore on, the dive team eventually found the car but had yet to locate the second victim. The temperature continued to fall rapidly, re-freezing the broken ice. When night fell, the recovery efforts halted.

The next morning, Keenan utilized his Phantom 3 Pro to create a map of the incident. This map would help to determine the best possible location to start looking for the second victim.



When recovery efforts could safely resume, the second victim was found within 30 minutes

Due to the dangerously cold weather and the hazards associated with diving under ice, this effort could have otherwise taken days longer to accomplish. More importantly, it led Chief Cobb to change his stance on drones, and he gave Keenan the go-ahead to start a UAS program for the department.

CHALLENGES WITH FUNDING

Funding the program with a limited budget was the first challenge for the Lynwood FD, something that many mid to small-sized departments face. One way around this was through donations and contributions. A local member of the community provided Lynwood

FD's with its first drone, and donations remain a key source of funding for the program today. Over time, these generous gifts began to prove their value. The defining phone delivery and water recovery incidents not only demonstrated the value of having drones in the field, but it also served as an essential experience used during future endeavors. The drone program continued to grow after multiple successful missions, which meant Lynwood FD was able to acquire more funding. Currently, they have three drones that they regularly use, including a DJI M600 Pro, a massive, rugged drone built for enterprise usage.

“Starting a UAS program for any agency can have its challenges. With a DJI aircraft, the flying is the easy part. Handling naysayers, showing value,



and securing funding will be some of the biggest hurdles you face,” Keenan Newton commented. “However, if you truly believe in something, keep at it. Find creative ways to support it and constantly look for opportunities to show value.”

THE VALUE OF PUBLIC SAFETY DRONE USAGE

The success of Lynwood FD’s UAS program symbolizes an ongoing trend in the public safety sector. Many small to mid-sized departments are beginning to realize that it is not entirely impossible to launch a drone program, even with limited funding or initial skepticism. As proven in the case above, over time, drone usage demonstrates its value in the field.

Drones are changing how government agencies serve the public in big ways and small. 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. For more information about setting up a drone program and learning about best practices to consider as you evaluate how drones could help meet the needs of your community, [download](#) this comprehensive report. ■

About the author

Wayne Baker is the Director of Public Safety Integration for DJI.

About the sponsor

DJI is a global leader in developing and manufacturing civilian drones and aerial imaging technology for personal and professional use. DJI was founded and is run by people with a passion for remote-controlled helicopters and experts in flight-control technology and camera stabilization. The company is dedicated to making aerial photography and filmmaking equipment and platforms more accessible, reliable and easier to use for creators and innovators around the world. DJI's global operations currently span across the Americas, Europe and Asia, and its revolutionary products and solutions have been chosen by customers in over 100 countries for applications in filmmaking, construction, inspection, emergency response, agriculture, conservation and many other industries.

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Get grants help



Review DJI's Qualified Entities Program



QUALIFIED ENTITIES PROGRAM (QEP)

DJI is committed to supporting our federal, state, and local public safety agencies through enabling the full range of capabilities of our UAV products. These capabilities will serve operating scenarios in advanced, higher-risk applications. DJI rolled out the Qualified Entities Program (QEP) to minimize operational restrictions for public safety partners that have been pre-verified.

Through the QEP, DJI will remove all United States and Canadian domestic geofencing limitations and altitude limitations for enterprise aircraft. This will allow users to fly in sensitive locations and at higher altitudes in order to enable critical operations such as disaster response, firefighting, search and rescue, and other public safety applications. The Qualified Entities Program is available on all DJI Enterprise models including the Mavic 2 Enterprise, Matrice 100, 200, 300 and 600, as well as most recent Consumer products including the Inspire 1, 2, Spark, Mavic lines and Phantom 3 and 4s, with an update to the command and control software (DJI Pilot and Mobile SDK) to remove all NFZ restrictions (time, geography, and altitude).

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HOW TO BECOME A QEP USER

Federal, state and local public safety agencies and entities must submit the following documentation:

- Completed QEP application form
- Copy of Part 107 license of chief pilot that is updated on a regular basis OR Certificate of Authorization (COA) from the FAA, OR other similar flight authorization document
- Copy of signed T&C
- Authorization letter on official entity letterhead from entity's UAV program manager or head of entity
- Contact information for partner entity's UAV program manager that is updated on a regular basis

For questions and to submit applications please email na.qep@dji.com

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