



Public Safety UAS Flight Training and Operations

ANALYSTS: Christopher Todd, CEM and Chief Charles Werner, (ret.)

ASSOCIATE ANALYST: Justine Hollingshead

KEY FINDINGS

- 1) The majority of public safety UAS programs are still relatively new with two or less years of flight operations under their belt.
- 2) Most agencies possess marginal bench strength with limited operational experience for their remote pilot corps. The majority of public safety UAS programs are staffed by five or fewer remote pilots who cumulatively fly an average of five or less missions per month – including training.
- 3) A lack of widely-recognized training and certification standards is hampering the growth of public safety drone operations. Most agencies are failing to use a Position Task Book (PTB) or Performance Qualification Standard (PQS) workbook to certify their remote pilots.
- 4) Public safety agencies are skeptical about relying on outside vendors for UAS training. Only 8% of public safety agencies believe external training vendors are extremely well qualified to train their drone operators, with about 88% of agencies either training entirely in-house, or using a mix of internal and external training providers.
- 5) A neglect of regimented firmware checks/updates is posing a potential safety risk for a sizable portion of public safety UAS operations with only 60% of agencies reporting at least weekly (or more frequent) updates.
- 6) More than 1 in 10 public agencies are not officially reporting or documenting UAS-related accidents or mishaps.

EXECUTIVE SUMMARY

Public safety agencies are moving to adapt unmanned aircraft systems (UAS) in an environment lacking certainty and standardization. Most public safety UAS programs are in their infancy with two years or less of operational experience. These programs are typically staffed by a small remote pilot corps for which the UAS program may be a collateral duty. The low average number of actual flights conducted per calendar month calls into question the actual capabilities of many public safety UAS programs.

The Part 107 remote pilot certification remains the widely-accepted starting point for most public safety drone operators. However, the sector must adopt formal pilot training standards that establish a baseline of pilot proficiency before evolving to more complicated, scenario-based tactical instruction with UAS. The ability of technology to continually streamline operations will not alleviate remote pilots from the overarching responsibility of operational safety.

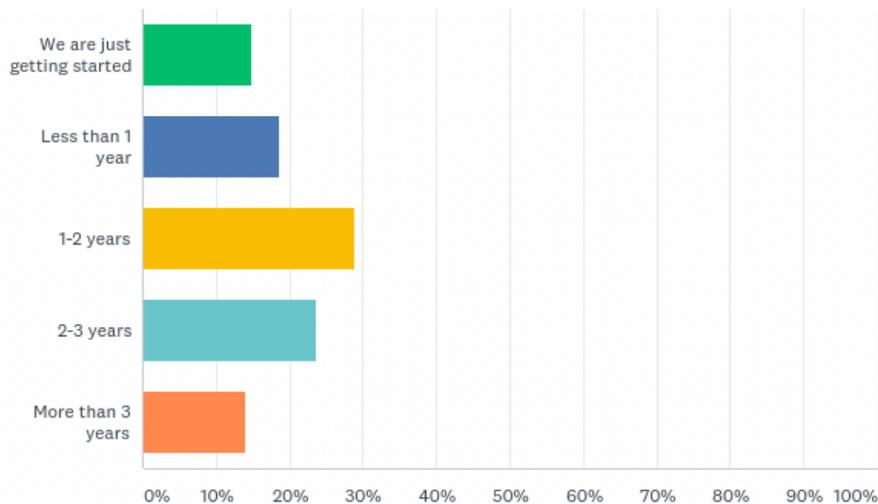
The overwhelming majority of public safety agencies are conducting training for UAS operators in-house, rather than relying exclusively on external training vendors, for which great skepticism exists. However, for departments with little to no aviation history, standing up a UAS program remains a daunting task fraught with pitfalls and dangerous risk factors. Agencies that want to build a successful UAS program must closely examine the ability of their organizational culture to adopt aviation-based principals and best practices.

INTRODUCTION

Drone programs are continuing to blossom as all types, sizes, and jurisdictions of public safety agencies work to incorporate UAS into their operations. New UAS programs are typically formed by in-house personnel who have either requested, or are directed, to take on the challenge of standing up flight operations for their agency.

Few agencies have more than three years of UAS operational experience under their belt. This creates an environment with limited guidance with virtually no written playbook on how best to design and implement an effective UAS program. The end result is public safety UAS program managers must often piece together their program while begging for, borrowing, and buying the insight and equipment needed to assemble their fleet.

FIGURE 1: HOW LONG HAS YOUR PUBLIC SAFETY UAS PROGRAM BEEN OPERATIONAL?



(n = 215)

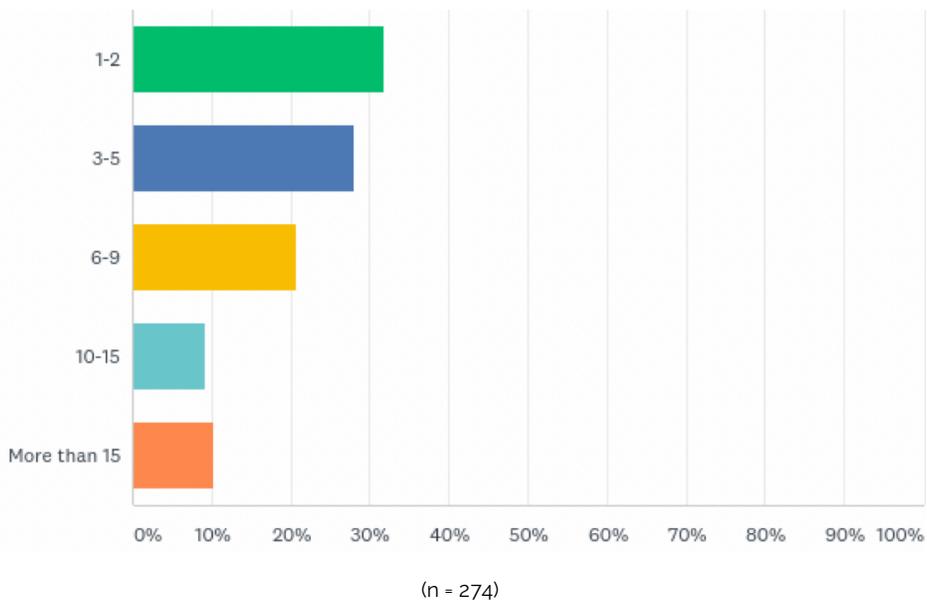
SOURCE: DRONERESPONDERS Fall 2019 Public Safety UAS Survey, September 2019

It should also be noted that the average public safety UAS program manager may not necessarily have previous aviation experience. Many agencies appear to be appointing personnel who have demonstrated an interest in remotely controlled model aircraft, drone photography, or simply possess the technical prowess to quickly learn off-the-shelf UAS technology.

While these program managers may quickly master the technological aspects of operating drones, they may not necessarily possess the required skill sets to establish and maintain an ongoing public safety aviation program in accordance with FAA, departmental, and other regulations.

The majority of public safety departments have five or less remote pilots on their UAS program roster. Unlike their manned aviation public safety pilot counterparts who primarily focus on aviation duties, UAS operations are often a collateral duty assignment for many public safety remote pilots who maintain other primary job responsibilities within their unit.

FIGURE 2: HOW MANY DRONE OPERATORS AND/OR REMOTE PILOTS CURRENTLY PARTICIPATE IN YOUR PUBLIC SAFETY UAS PROGRAM?



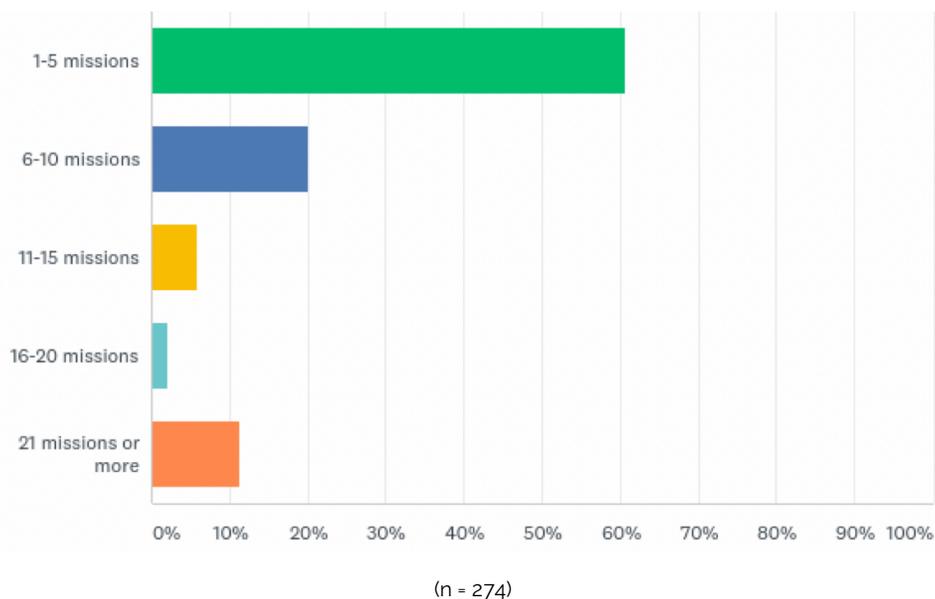
SOURCE: DRONERESPONDERS Fall 2019 Public Safety UAS Survey, September 2019

Collateral duty assignments combined with rotating shifts can be extremely problematic for UAS program managers who must schedule training and flight operations. This has forced some supervisors to hold training sessions at night, and exercises on weekends, to ensure that a reasonable portion of their flight team is available for the evolution.

The collateral duty quandary also appears to be impacting the ability for public safety remote pilots to acquire much needed stick time to enhance operational proficiency and develop new skill sets. According to DRONERESPONDERS Fall 2019 Public Safety UAS Survey data, over 60% of public safety UAS operations are flying a combined total of five or less missions per month – including training.

Factored on an annual basis, 60 flight missions on average may seem like a significant amount for a public safety UAS program. However, when divided by an average number of five pilots per UAS program, these 60 flights result in a mean average of 12 flights per year (1 flight per month) for the average public safety UAS remote pilot. Most professionals would likely concur that one UAS per month on average is not enough stick time to maintain robust operational proficiency.

FIGURE 3: INCLUDING TRAINING, HOW MANY PUBLIC SAFETY UAS MISSIONS DOES YOUR PROGRAM TYPICALLY FLY ON AVERAGE EACH CALENDAR MONTH?



SOURCE: DRONERESPONDERS Fall 2019 Public Safety UAS Survey, September 2019

What is indisputable is that first responders are often standing up drone programs without comparable resources, budgetary support, aviation experience, and the immersive culture of safety and risk management that one would expect to find supporting a traditional public safety aviation operation.

However, not all public safety UAS operations are bootstrapping their way into the air. Over 30% of DRONERESPONDERS Fall 2019 Public Safety UAS Survey respondents will be entering at least their third year of drone operations with the start of the new decade.

With nearly 40% of public safety UAS programs reporting six or more remote pilots, and 20% of programs reporting 120 flight missions or more per year, the sector is bearing witness to the first glimmer of what can be considered mature public safety drone operations. These programs should be able to provide essential key learnings and insights to help soften the learning curve for those public safety departments who are just starting to enter the realm of UAS operations.

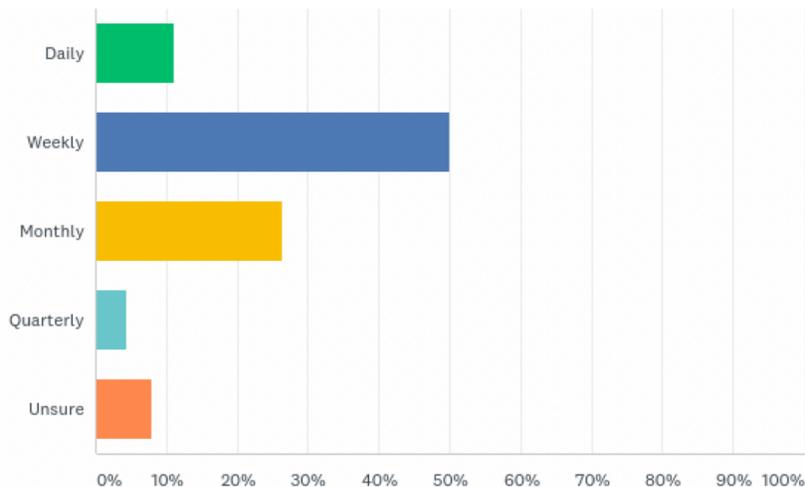
The trick now is to assimilate and document this garnered knowledge in a format that can be reasonably communicated to other public safety agencies around the globe that are struggling to implement and deploy a drone program within their jurisdiction.

PROBLEM

The lack of frequency with which most public safety UAS programs are conducting flight operations has a trickle-down effect beyond pilot proficiency. Firmware updates have become a necessary evil for all types of drone operations as manufacturers correct bugs and push out new capabilities for the software. For remote pilots who fly infrequently, a required firmware update can consume valuable minutes prior to launch – time that first responders don't have available when lives are on the line.

According to *DRONERESPONDERS Fall 2019 Public Safety UAS Survey* data (figure 4), slightly more than 60% of public safety remote pilots report they are checking for firmware updates at least weekly. While this trait demonstrates adherence to an essential best practice, the data remains alarming in that almost 4 of 10 remote pilots report they are only checking for firmware updates on a monthly basis at best. This means 40% of the total public safety drone fleet may be ill-prepared to swiftly launch their aircraft for emergency response purposes.

FIGURE 4: HOW FREQUENTLY DOES YOUR ORGANIZATION CHECK FOR UAS HARDWARE/SOFTWARE FIRMWARE UPDATES?



(n = 224)

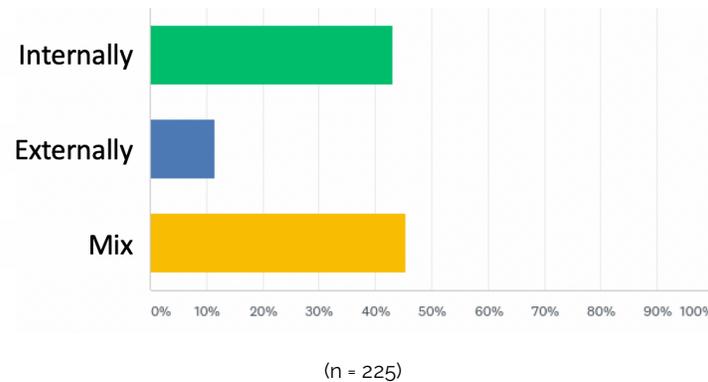
SOURCE: *DRONERESPONDERS Fall 2019 Public Safety UAS Survey*, September 2019

These types of nuances are emblematic of what distinguishes a professional, well-trained, public safety UAS program adhering to documented standard operating procedures versus those departments that are merely incorporating drones as an ancillary tool for sporadic use if needed. At the heart of the argument is the culture of risk mitigation instilled by the leadership at each public safety agency, combined with the UAS training program each program undertakes.

Because of the limited knowledge and guidance available surrounding UAS operations within the public safety sector, program managers are forced to create training programs from scratch. They borrow or buy information which they hope will fit their needs. Acquired guidance is often validated exclusively on the source of the content, rather than data-driven insights and analysis of the information. This can be problematic in a sector where no single source (other than the FAA) has emerged as an authority for standardized information.

According to *DRONERESPONDERS Fall 2019 Public Safety UAS Survey* data (figure 5), over 43% of public safety agencies are training their UAS program participant exclusively with in-house instructors, and over 45% of agencies are using a combination of in-house instructors and external contractors/vendors for their training. Less than 12% of agencies claim to be relying exclusively on external contractors/vendors for their drone training needs.

FIGURE 5: HOW DOES YOUR ORGANIZATION TRAIN YOUR UAS PROGRAM PARTICIPANTS?



SOURCE: *DRONERESPONDERS Fall 2019 Public Safety UAS Survey*, September 2019

While the driving force behind these data points remain open to speculation, conventional wisdom dictates several plausible contributing factors. The most probable reason why public safety agencies are relying heavily on in-house training instructors is likely due to a lack of funding availability based on limited budget appropriations and little to no available federal grant money.

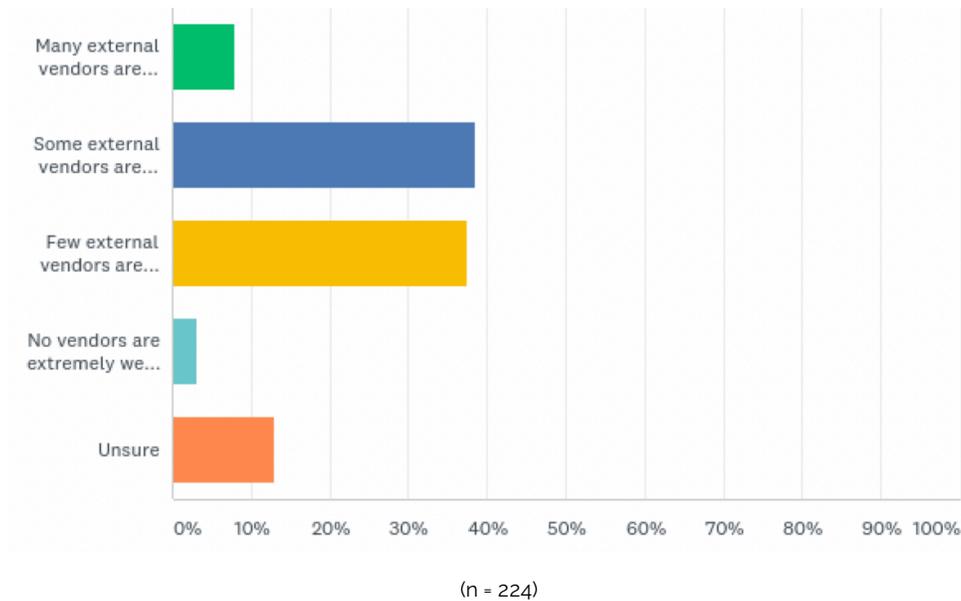
However, the lack of formal standards for public safety training and use of unmanned systems must not be discarded as another potential factor. Some agencies appear to be growing their program at a slow, steady pace as they await formal UAS program guidance from accrediting authorities to emerge upon the landscape.

As determined via focus group research at the *DRONERESPONDERS 2019 U.S. Public Safety UAS Summit* held in Las Vegas from October 29-30, the lack of standardized training and equipment is ranked as the most pressing issue facing public safety UAS programs. This research double-validated similar findings from the *DRONERESPONDERS Fall 2019 Public Safety UAS Survey*.

The minimal amount of available funding for UAS program training combined with the lack of formalized training and equipment standards for the public safety drone sector starts to paint a clearer picture as to why public safety agencies are shunning external vendors for their training needs; UAS program managers simply don't believe that most contract instructors possess the required knowledge and experience to successfully train their remote pilots.

According to *DRONERESPONDERS Fall 2019 Public Safety UAS Survey* data (figure 6), only 8% of survey respondents claimed to believe that many external vendors were extremely well qualified to train their UAS operators, with 40% of respondents claiming that few to no vendors met the mark. This data bodes ominous for those touting public safety UAS training.

FIGURE 6: WHICH OF THE FOLLOWING STATEMENTS BEST DESCRIBES YOUR PERCEPTION OF CURRENT UAS TRAINING PROVIDERS PROMOTING THEMSELVES AS EXPERTS TO PUBLIC SAFETY AGENCIES?



SOURCE: DRONERESPONDERS Fall 2019 Public Safety UAS Survey, September 2019

An assortment of regionally-based UAS training providers are continuing to target the public safety sector with what are essentially their own home-grown versions of a drone training curriculum. Yet savvy UAS program managers are playing coy as they await accredited training programs to emerge based on formalized standards and accompanied by grant funding opportunities.

When placed in this context, the beg, borrow, and buy strategy that many public safety UAS program managers seem to be employing as they cobble their drone program together makes more sense. This also explains the seemingly slow expansion of those drone programs which have already been initiated in many public safety agencies.

Thus, the absence of formalized standards for public safety UAS training, operations, and related equipment is hindering the ability of UAS program managers to develop and maintain efficient training programs for their personnel. Without established standards, there is little motivation to appropriate funding for training personnel in accordance with the insular curriculums presently offered by most external training vendors.

Aside from creating an inefficiency of UAS program operations, the domino effect of the lack of standardization quandary is that many UAS programs may be delayed in realizing their full potential capability. Even more concerning, the chasm between manned public safety aviation operations and unmanned drone operations – and their respective pilots – will remain in place until such time that drone operator proficiency evolves beyond the Part 107 remote pilot certification into something more tangible, profound, and consistent for inter-agency flight operations on a standardized basis.

SOLUTION

The time has come to implement formal standards for the training and certification of public safety remote pilots and the equipment they operate. Public safety UAS operations will continue to be under intense public scrutiny for the foreseeable future. Accordingly, these agencies must subscribe to higher standards as they gain experience, develop proficiency and garner the trust of the public.

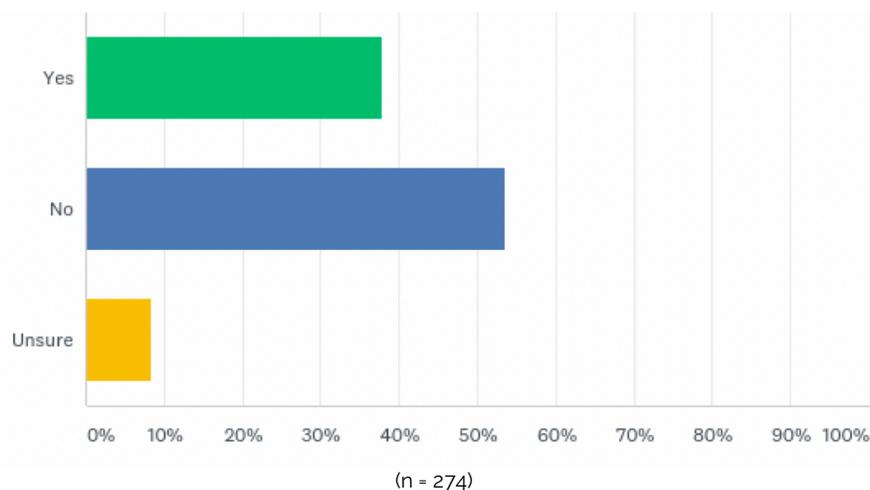
The FAA Part 107 remote pilot certification is a solid starting point that all public safety drone operators and program managers should undertake. However, it should only be perceived as the entry point for public safety drone operations, rather than a final certification.

Additionally, while the public safety agency COA can be a valuable pathway for unmanned aviation operations, it provides too much leeway for an inexperienced organization to potentially cut corners in building out their UAS program. Hence, agencies should refrain from pursuing a public aircraft operations COA until such time that they have established a solid operational foundation under Part 107.

As public safety drone programs commence operations, UAS program managers must implement tools that document remote pilot training and proficiency such as position task books (PTB) or performance qualification standard (PQS) workbooks. These tools have long-proven effective towards helping to qualify and certify personnel charged with undertaking complex mission sets.

According to *DRONERESPONDERS Fall 2019 Public Safety UAS Survey* data (figure 7), less than 40% of public safety UAS operations are currently using PTB or PQS tools to qualify their remote pilots. These tools should be implemented swiftly to help guide drone operators through a specified qualification process that further establishes standards for departmental drone operations, while also documenting pilot proficiency towards specific skill sets.

FIGURE 7: DOES YOUR PROGRAM USE A POSITION TASK BOOK (PTB), PERFORMANCE QUALIFICATION STANDARD (PQS), OR OTHER TRACKING DEVICE TO TRAIN PERSONNEL ON UAS OPERATIONS?



SOURCE: *DRONERESPONDERS Fall 2019 Public Safety UAS Survey*, September 2019

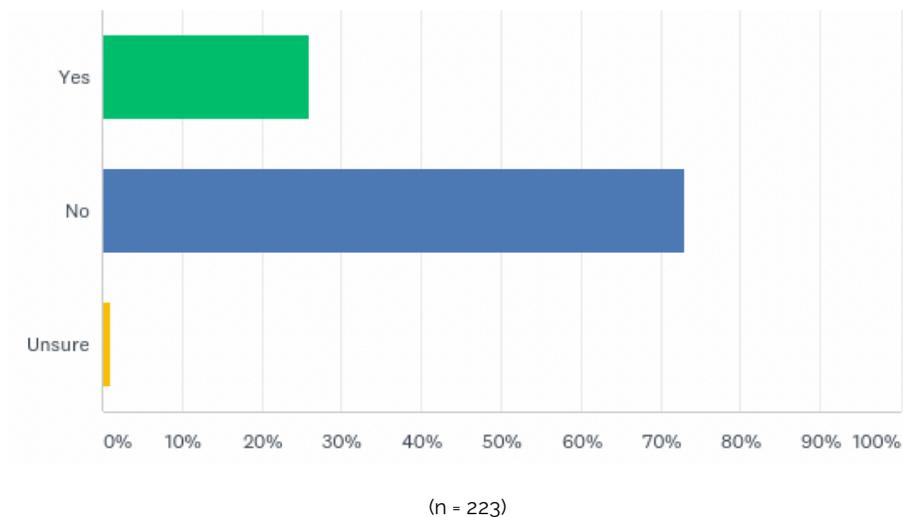
National Institute of Standards and Technology (NIST), an organization within the U.S. Department of Commerce, has been developing and evolving a series of performance tests for sUAS to help evaluate drone technology as well as operator proficiency.

The NIST Standard Test Methods for Small Unmanned Aircraft Systems typically involves an assortment of various apparatus that contains specific targets and obstacles that a remote pilot must successfully navigate to demonstrate safe and effective handling of a UAS, as well as proficiency using the sensor payload to successfully acquire visual data.

To date, the NIST solutions represents the most scientifically validated mechanism for fairly assessing remote pilot proficiency surrounding the specific skill sets needed for basic public safety UAS flight operations.

The types of skills that the NIST course develops should also help to diminish the amount of accidents and mishaps that public safety drone programs experience. According to *DRONERESPONDERS Fall 2019 Public Safety UAS Survey* data (figure 8), 25% of public safety agencies with drone programs have experienced a UAS-related accident or mishap.

FIGURE 8: HAS YOUR AGENCY EXPERIENCED A UAS-RELATED ACCIDENT OR MISHAP?



SOURCE: *DRONERESPONDERS Fall 2019 Public Safety UAS Survey*, September 2019

All public safety UAS programs managers should acquaint themselves with the NIST standard test method and seek to incorporate NIST testing into the PTB/PQS workbooks for their agency as the process of developing formal standards for public safety UAS program management and operations continues to progress. Information about the NIST standard test methods is available online via RobotTestMethods.nist.gov

The American National Standards Institute (ANSI), a private, non-profit organization, is also working to implement standards to help shape public safety UAS operations. The ANSI Unmanned Aircraft Systems Standardization Collaborative (UASSC) mission is to coordinate and accelerate the development of the standards and conformity assessment programs needed to facilitate the safe integration of UAS into the U.S. national airspace system (NAS).

The UASSC mission represents a collaborative effort between ANSI, the FAA, the U.S. Department of Homeland Security Science and Technology Directorate, AIRT, DRONRESPONDERS, and other key stakeholders to develop and implement a standardization roadmap for UAS integration onto the NAS. More information is available online via ansi.org/uassc

On October 24, 2019 the National Fire Protection Association (NFPA) announced it had received nearly \$1 million in grant funding from FEMA to develop a free public safety drone compliance program for the fire service. The research NFPA conducts will likely complement *NFPA 2400, Standard for Small Unmanned Aerial Systems* which was published in 2018 to help public safety agencies address key issues and challenges surrounding the deployment and maintenance of drone programs.

However, NFPA's new initiative via the FEMA grant is slated to be specific to the fire service. This means potential benefits for other public safety organizations – most notably law enforcement agencies – may be fleeting. The U.S. Department of Justice (DOJ) appears to be making some headway in this realm. The DOJ recently updated its policy on the use of unmanned aircraft systems by Federal law enforcement agencies under title 9-95.100.

The foundation that the FAA has already provided combined with the work that NIST, ANSI, NFPA, and the DOJ is undertaking, along with additional support and guidance from organization like AIRT, AUVSI, and the NPPA, should lead to the creation of formal standards for public safety UAS operations in the foreseeable future.

It is important to note that no single organization will be able to adopt and implement meaningful standards on their own accord. Only a consortium of capable partners with essential support from professional associations, unions, and other key stakeholders will be able to fully implement UAS standardization thereby ensuring that the final deliverables are not ignored and relegated to the abyss.

CONCLUSIONS

- 1) The lack of formal standards surrounding remote pilot training and drone operations is the most pressing issue facing the public safety UAS sector.
- 2) The growth and maturity of public safety drone programs remains inhibited by a lack of funding, resources, and standards for training and operations as managers are forced to cobble together their UAS programs from scratch.
- 3) Program managers are skeptical about the ability of most external contractors/vendors to train public safety drone operators beyond the initial Part 107 certification process.
- 4) The proficiency of most remote pilots in the public safety sector remains questionable due to a lack of training standards, collateral duty requirements, and limited flight hours.
- 5) Public safety UAS program managers should adopt PTB/PQS workbook tools that incorporate NIST standard test methods to train and certify remote pilots.
- 6) Standardization for public safety UAS training and operations can only be accomplished by a consortium of capable partners who achieve buy-in from key stakeholders.

SURVEY METHODOLOGY

The DRONERESPONDERS *Fall 2019 Public Safety UAS* represents a quantitative method, cross-sectional, self-selected, online questionnaire survey conducted by AIRT, Inc. and administered using SurveyMonkey technology between August 27 and September 15, 2019.

The survey was directly promoted to a highly-targeted, known, yet self-selecting, group of public safety UAS professionals representing a wide cross-section of the public safety UAS sector. Total responses per question range between 223 and 274 respondent answers. The margin of error for this survey is projected to be +/- 5%.

SOURCES AND ADDITIONAL RESOURCES

1. *Fall 2019 Public Safety UAS Survey*, September 16, 2019, DRONERESPONDERS
2. *Commercial Vendors and the Public Safety UAS Landscape*, October 30, 2019, Christopher Todd and Charles Werner, DRONERESPONDERS
3. *Standard Test Methods to Evaluate Small Unmanned Aircraft System Capabilities and Operator Proficiency for Emergency Response Applications*, Adam Jacoff, NIST, <http://robottestmethods.nist.gov>
4. *ANSI Unmanned Aircraft Systems Standardization Collaborative (UASSC)*, Jim McCabe and Lucy Yarosh, ANSI, <http://www.ansi.org/uassc>
5. *Drone Procedure Optimisation Study*, Gemma Alcock, Skybound Rescuer, 2019
6. *NFPA is awarded FEMA funds to develop free public safety drone compliance program for the fire service*, NFPA, October 24, 2019
7. *Department of Justice Updates Drone Policy*, Miriam McNabb, DroneLife, November 29, 2019

ABOUT

DRONERESPONDERS is the world's fastest growing non-profit program supporting public safety UAS. The DRONERESPONDERS mission is to facilitate preparedness, response and resilience using unmanned aircraft systems and related technologies operated by public safety, emergency management, and non-governmental volunteer organizations around the world. The DRONERESPONDERS Public Safety Alliance is a 501(c)3 non-profit operating program of [AIRT](http://airt.com), Inc. For more information on DRONERESPONDERS, please visit: <http://droneresponders.org>

