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Brief: Use of Drones by Public Safety Agencies and the Benefits of New Beyond Visual Line of Sight Rules

Introduction: Public safety agencies are increasingly adopting Uncrewed Aircraft Systems (UAS or drones) to enhance their operational capabilities. Drones provide real-time aerial intelligence, improve response times, and reduce risks to personnel during emergencies. With advancements in technology and regulatory changes, the scope of drone usage in public safety is expanding and will continue to expand if new Beyond Visual Line of Sight (BVLOS) rules are put into place in a timely manner.

Current Use of Drones by Public Safety Agencies

1. **Search and Rescue (SAR) Operations**

    a. Drones are used for locating missing persons, especially in hard-to-reach or dangerous terrain. Equipped with thermal imaging cameras, they can quickly identify heat signatures in forests, mountains, or even urban settings at night.

2. **Disaster Response and Recovery**

    a. During natural disasters such as hurricanes, floods, or wildfires, drones provide critical aerial views of affected areas. This helps emergency responders assess damage, identify hazards, and deploy resources efficiently.

3. **Law Enforcement**

    a. Drones are used in law enforcement for surveillance, crowd monitoring, suspect tracking, and crime scene investigations. They can monitor large public events or high-speed pursuits, providing real-time footage that improves situational awareness.

4. **Firefighting**

    a. Drones are valuable for wildfire monitoring, allowing firefighting teams to track the spread of fires, assess hazardous areas, and plan effective containment strategies without exposing personnel to danger. Larger drones may be used in the future to actually help mitigate small fires before they become large and costly wildfires.

5. **Traffic Accident and Crime Scene Investigation**

    a. Drones are used to capture high-resolution aerial images of accident sites or crime scenes. This helps investigators document evidence without disrupting the scene and reduces the time needed for clearance.

Benefits of New BVLOS Rules

Until recently, drone operations were largely restricted to operations within the operator's visual line of sight. However, new BVLOS regulations (which allow drones to fly beyond the operator's line of sight) are expected to significantly enhance the capabilities of public safety agencies in the following ways:

1. **Expanded Operational Range**

    a. BVLOS rules will allow drones to operate over longer distances without the need for constant visual contact. This is particularly valuable for large-scale search operations, such as searching vast wilderness areas, highways, or disaster zones, where drones can cover more ground efficiently.

2. **Increased Flexibility in Emergency Responses**

a. With BVLOS approval, drones can be deployed from a remote location, without the need for personnel to be physically present. This enables agencies to respond more quickly to emergencies in locations that would otherwise be hard to reach, such as areas with poor infrastructure or hazardous conditions.

3. **Improved Real-Time Situational Awareness**

    a. The ability to monitor and track large areas without line-of-sight limitations means drones can continuously feed data back to incident commanders. This enhances decision-making and improves coordination across multiple response teams. This has been most effective in the "Drone as First Responder" style program, whereby drones are deployed directly from rooftops in response to 911 calls, and can arrive on scene within 60-180 seconds, frequently beating the first-in officers to the scene. This provides extremely valuable real-time situational awareness that can help prevent life-threatening situations to escalate.

4. **Reduced Risk to Personnel**

    a. BVLOS capabilities reduce the need for ground teams to enter dangerous or hostile environments. Drones can safely assess high-risk areas, such as hazardous material spills, fire zones, or active crime scenes, minimizing potential harm to human responders.

5. **Cost Efficiency and Resource Optimization**

    a. Drones, when operated BVLOS, can reduce the need for costly manned aircraft, such as helicopters, for surveillance and monitoring. BVLOS drone operations can also streamline workflows and reduce operational delays, making resource allocation more effective.

6. **Integration with Other Technologies**

    a. Drones operating BVLOS can be integrated with artificial intelligence (AI), automated flight systems, and real-time data sharing platforms. This allows public safety agencies to implement predictive analytics, automated alerts, and smarter resource management, improving overall public safety outcomes.

The BVLOS Aviation Rulemaking Committee (ARC) made several key recommendations that directly relate to the use of drones by public safety agencies. These recommendations were aimed at balancing the need for public safety benefits while ensuring safety, accountability, and operational efficiency in BVLOS operations. Below are the primary recommendations from the ARC regarding public safety drone use, which mirrors what we as an industry are hoping to see in the proposed Part 108/BVLOS rulemaking:

1. Safety Protocols and Risk Mitigation[1]

- **Risk-Based Approach**: The ARC recommended adopting a risk-based framework for BVLOS operations, where the level of risk would dictate the operational conditions and requirements. Public safety agencies, which often operate in controlled or low-risk environments (such as rural or disaster areas), could benefit from more flexible and tailored BVLOS operations, as long as the risks are managed.
- **Safety Management Systems (SMS)**: The ARC recommended that public safety agencies adopting BVLOS drone operations implement an SMS. This system would help agencies identify, assess, and mitigate safety risks, ensuring that operations are conducted in a safe manner.
- **Geo-fencing and Other Safety Features**: It was suggested that drones operating BVLOS in public safety scenarios incorporate advanced technologies like geo-fencing to prevent unintended airspace incursions and to protect sensitive areas, such as hospitals or restricted zones.

[1] https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/5424

2. Operational Flexibility for Emergency Situations[2]

- **Increased Flexibility in Emergency Response**: The ARC recommended allowing public safety agencies more operational flexibility, particularly during emergencies, by enabling "emergency BVLOS operations" without the need for the full regulatory approval process. This would allow rapid deployment of drones to assist with search and rescue, disaster response, or crime scene investigations, especially in areas where line of sight operations would be impractical or dangerous.
- **Pre-Approved Emergency Operations**: For certain public safety use cases, it was suggested that there could be provisions for public safety agencies to have pre-approved BVLOS flight plans or blanket authorization. This would allow drones to be deployed quickly, particularly in large-scale or urgent situations like wildfires, floods, or hostage situations, where the need for fast deployment and situational awareness is critical.

3. Remote Pilot Training and Qualifications[3]

- **Specialized Training for Public Safety Drone Operators**: The ARC recommended that public safety agencies ensure that drone operators have specialized training to handle BVLOS operations. This includes ensuring that operators are proficient in managing drone systems, understanding airspace regulations, and responding to emergencies.
- **Continuous Education and Certification**: Ongoing training and certification would be crucial for keeping operators up to date with evolving technology and regulatory requirements. It was emphasized that public safety personnel need advanced skills to manage complex drone systems, particularly when operating BVLOS in dynamic, potentially hazardous environments.

4. Technology and Communication Requirements[4]

- **Reliable Communication Links**: The ARC stressed the importance of maintaining **robust communication** links between drones and ground control stations for BVLOS operations. Public safety agencies would need to employ reliable, low-latency communication systems to ensure real-time control and monitoring, especially in critical situations like search-and-rescue operations or crime scene surveillance.
- **Autonomous and Detect-and-Avoid Systems (DAA)**: The ARC recommended that BVLOS operations be equipped with DAA technologies to ensure drones can safely detect and avoid obstacles or other aircraft in the airspace. For public safety, this would also help reduce the risk of collision in complex or congested environments.

5. Integration with Air Traffic Management (ATM)[5]

- **Coordination with Air Traffic Control**: For BVLOS operations to be viable, especially in more populated or controlled airspaces, public safety agencies would need to coordinate with ATM systems. The committees recommended mechanisms for ensuring that BVLOS operations do not conflict with manned aviation or other drone operations. Public safety agencies would be encouraged to use UAS Traffic Management (UTM) systems to ensure safe integration with other airspace users.

6. Data Collection and Evidence Handling[6]

- **Standardized Data Protocols for Evidence**: Given that public safety agencies often use drones for investigations, the ARC recommended establishing standardized protocols for data collection and evidence handling during BVLOS operations. This would ensure that data captured by drones (e.g., for crime scenes or accident investigations) could be used in court or legal proceedings.

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[2] Id.
[3] Id.
[4] Id.
[5] Id.
[6] Id.

- **Real-Time Data Sharing**: They also recommended that drones operating BVLOS be capable of real-time data sharing, so incident commanders and response teams can access aerial intelligence immediately, improving decision-making in fast-paced situations.

7. Monitoring and Reporting Requirements[7]

- **Continuous Monitoring of BVLOS Flights**: The ARC recommended that public safety agencies implementing BVLOS operations be required to report and monitor flight data to relevant authorities. This would ensure that operations are conducted in accordance with safety standards and regulatory compliance and would also provide an opportunity for ongoing evaluation and feedback.

Summary of Key Benefits from These Recommendations for Public Safety:

1. **Enhanced Operational Reach and Flexibility**: The ability to operate BVLOS gives public safety agencies the flexibility to cover large or hard-to-reach areas, improving efficiency in search and rescue, disaster response, and law enforcement surveillance.

2. **Faster Response Times**: Pre-approved emergency BVLOS operations allow agencies to deploy drones immediately in high-urgency situations, such as wildfire management or crime scene analysis, without delays in obtaining regulatory clearances.

3. **Safety Assurance**: With recommendations for advanced safety systems, including geo-fencing, DAA, and risk-based frameworks, BVLOS operations can be conducted with minimized risks to public safety personnel and other airspace users.

4. **Integration with Air Traffic Control**: Ensuring BVLOS operations are integrated into the national airspace system will allow public safety drones to operate safely and efficiently alongside manned aircraft, especially in populated or congested areas.

5. **Improved Data Handling**: Standardized protocols for data collection and evidence handling will ensure that public safety agencies can use drone-generated data in legal and investigative processes with full integrity.

These recommendations are part of the broader effort to safely integrate drones into everyday public safety operations, improving both efficiency and safety for personnel and the public. As BVLOS regulations evolve, public safety agencies will likely see increased autonomy in deploying drone technology for a variety of critical missions.

Market Impact

The market impact of allowing BVLOS flight for public safety drone operations would be significant, driving growth across several dimensions. It would enhance operational capabilities, streamline workflows, and ultimately increase demand for drones and supporting technologies. Below are the key areas where BVLOS regulations would create a notable market impact for public safety drone use:

1. Expansion of Use Cases and Demand for Drones

- **Wider Range of Applications**: BVLOS capabilities open the door for a broader range of public safety operations. Drones can now be used for large-scale, continuous surveillance of remote areas, such as wildfire monitoring, search and rescue missions, disaster response, and traffic monitoring over highways and urban areas. This would drive demand for drones tailored to these environments, from ruggedized drones to specialized payloads (e.g., thermal imaging, gas detection, etc.).
- **Increased Frequency of Drone Deployments**: With BVLOS approval, drones can be used more frequently and in more varied conditions, including night-time operations or when visibility is reduced (e.g., due to smoke, fog, or

[7] Id.

poor weather). This shift would lead to a higher frequency of drone use in public safety, increasing the volume of purchases and the number of recurring contracts for drone services.

2. Growth in Drone Technology and Innovation

- **Innovation in Autonomy and AI**: To operate BVLOS safely, drones will require autonomous flight capabilities, including advanced DAA systems, collision avoidance, and automated flight planning. This will drive innovation in these fields, resulting in new products and solutions tailored to public safety needs, such as:
    - **Improved Sensors and Payloads**: Cameras, infrared sensors, and LiDAR technology will evolve to meet the demands of BVLOS operations, particularly for mission-critical scenarios like SAR or fire detection.
    - **AI-Powered Data Analytics**: With BVLOS flights generating large volumes of data, there will be increased demand for AI-driven analytics to interpret this data in real time for public safety decision-making, such as identifying missing persons or detecting fire hotspots in vast areas.
- **Battery and Power Solutions**: Longer BVLOS flights will require more robust power solutions, including extended battery life and hybrid/electric propulsion systems. Manufacturers will need to innovate in the development of more efficient power systems to support longer operational times without needing to land or recharge frequently.

3. New Market Segments for Drone Services

- **Drone-as-a-Service (DaaS) Growth**: As BVLOS regulations become more established, the public safety sector will increasingly rely on drone service providers to handle specialized operations like large-scale surveillance, disaster monitoring, or crime scene investigation. This would open up a new market segment for drone service companies, allowing them to expand operations by offering BVLOS services under established regulatory frameworks.
- **Public-Private Partnerships**: Governments at the local, state, and federal levels may partner with private drone operators or manufacturers to deliver BVLOS-based services on a contract basis. This partnership model could lead to more drone service businesses specializing in public safety, which may include surveillance, aerial inspections, search and rescue missions, and traffic management.

4. Regulatory Compliance and Certification

- **New Regulatory Frameworks**: As BVLOS flights become more common, companies offering drone services to public safety agencies will need to navigate and comply with new regulatory standards. This creates opportunities in:
    - **Regulatory Consulting and Compliance Services**: Providers specializing in drone regulations, safety management systems, and BVLOS certifications will see increased demand. These companies can assist public safety agencies in obtaining the necessary approvals for BVLOS operations.
    - **Insurance Products**: With the increased scope of operations, the need for specialized drone insurance (covering BVLOS operations, liabilities, and high-risk scenarios) will rise, creating a market for insurance companies to develop tailored policies for public safety drones.

5. Job Creation and Workforce Development

- **Drone Pilots and Operators**: The demand for remote pilots capable of conducting BVLOS operations will grow, requiring more specialized training programs. This will result in the expansion of drone training schools, online courses, and certifications.
- **New Roles in Operations and Data Analysis**: Public safety agencies will increasingly need personnel who can operate drones in BVLOS scenarios, as well as data analysts who can interpret and act on the real-time information

provided by drones in emergency situations. New job opportunities in the drone operations and aerial data analysis fields will emerge as BVLOS operations become more routine.

6. Increased Integration with Broader Public Safety Technologies

- **Smart City Integration**: Public safety drones operating BVLOS can be seamlessly integrated into the smart city ecosystem, enhancing urban management by providing real-time data to emergency response teams, traffic management systems, and even law enforcement. This could lead to new partnerships between drone manufacturers and urban planners or municipal governments.
- **Data Sharing and Cloud Platforms**: With BVLOS operations generating large amounts of real-time data, there will be a greater reliance on cloud computing and data-sharing platforms to store and analyze information from drones. Companies providing cloud-based data services, including secure data storage and processing for public safety, will see expanded market opportunities.

7. Cost Savings and Efficiency Gains

- **Reduced Operational Costs for Public Safety Agencies**: BVLOS operations will allow public safety agencies to cover larger areas and conduct more comprehensive surveillance with fewer personnel and equipment. Drones can conduct aerial monitoring in situations where it would be too costly or risky to deploy manned aircraft or send human teams into dangerous areas (e.g., fire zones, hazardous material spills). This efficiency will likely lead to cost savings and budget reallocations toward expanding drone fleets and services.
- **Reduced Need for Manned Aircraft**: With BVLOS capabilities, drones can replace some manned aircraft (e.g., helicopters) used for public safety missions, leading to cost reductions in terms of personnel, fuel, maintenance, and flight hours. The broader market for drones will benefit as agencies adopt more cost-effective, scalable drone solutions.

8. Global Expansion and Market Adoption

- **International Adoption**: As BVLOS regulations are refined and adopted by national aviation authorities (e.g., the Federal Aviation Administration (FAA), the European Union Aviation Safety Agency (EASA), etc.), public safety drone services could expand globally. Public safety agencies in other countries facing similar challenges (e.g., search and rescue, wildfire management, urban crime control) will look to the U.S. and other early adopters for models on how to integrate drones into their operations. This could increase demand for BVLOS drone technology and services worldwide.
- **Increased Government and Military Spending**: Governments and military agencies involved in disaster relief, border patrol, or law enforcement will see the value of BVLOS drone technology and expand their investments in the sector. This could increase funding for drone manufacturers, software developers, and service providers focused on public safety.

Current BVLOS Operations

Public safety agencies have been flying BVLOS by operating within the constraints of existing regulations, often leveraging special waivers, exemptions, and case-by-case approvals granted by the FAA. While BVLOS flights are generally restricted under standard drone rules, public safety agencies can still operate BVLOS under certain conditions by meeting specific safety and operational requirements.

Here's how public safety agencies are currently conducting BVLOS operations while staying within the existing regulatory framework:

1. Obtaining Special Waivers or Exemptions

- **Part 107 Waivers**: The FAA's Part 107 regulations govern the use of commercial drones in the U.S., including BVLOS operations. Under Part 107, public safety agencies can apply for a waiver to conduct BVLOS operations if they

meet certain requirements, such as having an SMS in place, using advanced collision avoidance technology, and providing evidence of the drone's capabilities to operate safely at distances beyond the pilot's visual line of sight.

- **Part 91 Wavers**: The FAA's Part 91 waivers, specific to public safety agencies, allow public aircraft operators to conduct limited BVLOS operations, including the ability to fly up to 2 miles away, while only maintaining a visual of the *airspace* rather than the *aircraft.* These regulations still require visual observers to be present on a rooftop or other observation location and maintain contact with the pilot in command who may be in a different location. Additional permissions recently are allowing agencies to fly without observers, provided they stay under two hundred feet above ground level, and employ ADS-B transponders. Finally, operations are starting to be allowed between 200 and 400 feet above ground level with approved ground-based radar detect and avoid systems.

While the current regulatory framework places significant constraints on BVLOS flight, public safety agencies have found ways to operate safely and effectively within these limits. However, as the FAA and other regulatory bodies continue to evolve BVLOS rules, public safety agencies will likely have even greater flexibility and ability to deploy drones in new, life-saving ways.

Conclusion and Why Now?

The integration of drones into public safety operations has already demonstrated significant benefits in terms of efficiency, safety, and cost reduction. The introduction of new BVLOS rules further enhances these advantages by expanding the operational range, improving situational awareness, and reducing risks to personnel. As drone technology continues to evolve and regulatory frameworks adapt, public safety agencies are poised to leverage UAS to improve response times, save lives, and enhance operational effectiveness in critical situations.

Allowing BVLOS flight will be a game changer for the public safety drone market, unlocking new opportunities across several dimensions. The increased use of drones in BVLOS operations will lead to innovations in technology, expanded market segments, cost savings, and job creation. The demand for drones will rise, creating growth for manufacturers and service providers. Public safety agencies will benefit from more efficient, flexible, and cost-effective solutions, ultimately improving their ability to respond to emergencies, monitor large areas, and protect communities.