

Applications for  
Drones in Aviation Management  
and Airport Operations

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### **Abstract**

Small unmanned aerial systems, commonly known as drones, are an exciting and useful aspect of airport operations when used alongside current aviation management practices. Upon review of current literature, data has shown only a very small percentage of airports are utilizing the vast number of practical applications that drones can offer to support the efforts of airport management teams. Not only can a drone system be useful for airfield inspections and wildlife management, but also emergency response. These aspects of airport operations require equipment and personnel that ultimately require more time and resources than are used by small unmanned aerial systems.

*Keywords:* small unmanned aerial systems, drones, airport operations, aviation management, wildlife management

Small unmanned aerial systems (sUAS), and unmanned aerial vehicles (UAV) commonly known as drones, have been used in airport operations and aviation management for several years now. In this study, we will look at the current uses of drones, but more importantly, research the applications of drone technology for airport operations and aviation management. This review of current literature will demonstrate why early adoption of this technology would benefit airports of any size. Although there are many time and cost-saving advantages to utilizing drones in airport operations, only 9% of airports are actively using UAS for airport purposes (National Academies of Sciences, Engineering, and Medicine, 2019).

Drone use throughout the world has begun to realize exponential growth due to the discoveries of multiple applications for drones in the commercial aviation world. In 2017 alone, drone purchases worldwide hit more than 3 million, accompanied by 1 million Federal Aviation Administration (FAA) drone registrations. Thanks to the FAA's creation of CFR Part 107 and the new Low Altitude Authorization and Notification Capability (LAANC), great progress has been made in facilitating a safe environment of regulations for operating these new drones (Dowell, Guillot, 2019).

However, not all drone pilots have been properly trained in new regulations; some tend to overlook the rules even with knowledge of their existence. This has resulted in several incidents of drones flying into controlled airspace, causing major shutdowns of airports in the past (Mueller, Tsang, 2018). As a result, drones have earned a reputation of being termed "nuisance drones", and in some cases, possible invasion of privacy. What the general public does not see, however, is the large spectrum of practical applications that drones can offer when flown in a controlled setting by a licensed and trained professional pilot.

Drones that have been flown into airports and over runways have caused thousands, if not millions of dollars per event in the form of shutdowns, passenger delays, and aircraft diversions. One example occurred at the Gatwick Airport in the United Kingdom. Beginning on December 19<sup>th</sup>, 2018, at approximately 9:00 pm, a drone was flown over the perimeter fence and runway. Over the next 48 hours, 50 drone sightings had been filed, 20 police units had been deployed, and the military was called to secure the area for reopening. At least 800 flights had been canceled affecting over 100,000 passengers. Also, flights carrying 10,000 passengers had to be diverted to alternate airports as far away as Paris (Mueller, Tsang, 2018). With the current possibility of more frequent drone occurrences due to an increase in drone traffic, there are surprisingly very few airports that have a plan to monitor and control drone traffic.

Richard King, assistant airport director of Joe Foss Field Airport (FSD) in Sioux Falls, South Dakota, stated that there are legal challenges for those airports wanting to implement drone intervention plans to deal with flyovers from an un-authorized drone pilot. According to the FAA, when someone registers a drone, the UAS essentially becomes an aircraft like any other. “As of today, there is technically no difference in shooting down someone’s DJI [the world’s foremost drone manufacturer] or shooting down a 737- aside from the civil liability of course,” King stated. “Try having a conversation with a legislator about needing a law allowing the ‘shutdown of a drone’ vs. ‘shutdown of an aircraft.’ Gives it a whole different feel if you are uninformed, and this results in a blanket moratorium on just about anyone being able to do anything to stop a UAV” (R. King, personal communication, July 29, 2020).

New drone systems are being developed that could be used to avoid such problems in the future. According to Tim Bean, founder and CEO of Fortem Technologies, 90 percent of airports are not prepared for drones. Fortem Technologies is currently testing a drone defense system that

would eliminate nuisance drones from flying into controlled airspace. This is accomplished by using sophisticated radar systems that detect nuisance drones and send out a “hunter drone” that could pluck drones out of the sky, or dogfight them if necessary. The system is already being used to monitor runways at the Salt Lake City Airport, among others. According to Bean, “Airports, stadiums, borders, oil and gas refineries spend a lot of money on ground security, but I think they now need to think about their airspace security” (Mueller, Tsang, 2018 p.1).

In addition to providing security benefits for airport airspace, another application of UAS are the airport facilities and airfield safety inspections. The excellent camera technology that comes standard on most commercial drones has the potential to provide documentation on building conditions, pavement and marking issues, rooftops, parking lots, security fencing, windsocks, safety areas, signage, runway foreign object debris identification (Dowell, Guillot, 2019). UAS can also provide Precision Approach Path Indicator (PAPI) inspections (Marcellin 2020).

Deploying an unmanned aerial system versus deploying a team of trucks and personnel has the benefit of saving time and money, while also being able to record images and video for review and documentation purposes. Drones can be programmed to fly a specific path and take high-resolution footage of areas under inspection such as runways and perimeter fencing. This eliminates the need for vehicles and personnel to manually inspect these areas. Savannah Hilton Head International has already begun implementation of these automated sUAS to preform runway and perimeter fence inspections and assist with wildlife management (Wysocky, 2018).

But maintenance and inspections are only a small part of the safety aspects of integrating an unmanned aerial system into airport operations. One of the most important applications of drone technology in airport operations is the use of drones for emergency response. A fast response to the scene of an aircraft accident or large fuel spill can help determine incident complexity promptly

while maintaining a live video feed of the incident from a remote location. Other considerations might be the ability of drones to determine evacuation paths for passengers fleeing an aircraft fire, locate those ejected from the aircraft, intervene in the case of an active shooter from the air, or finally, assist in planning the site of a triage area for the emergency response team. (National Academies of Sciences, Engineering, and Medicine, 2019).

In aviation security and safety, situational awareness is a key factor that can determine the difference between the resolution of an incident, or deterioration of an event into a disaster. According to *The Journal of Automation and Control Engineering*, 18,000 police departments, fire departments, and other first responders have expressed their interest in drone technology, recognizing the wide spectrum of potentially life-saving applications of drones. Running concurrently with the first responder mobilization, drones have been utilized to create a perimeter around emergency sites giving information to an emergency management team as it unfolds (Ison, D., Khalid, A., Terwilliger, B., Thirtyacre, D., Vincenzi, D., Witcher, K. 2015). Drones tethered to ground power may theoretically remain in the air indefinitely, so accurate information of a scene can be monitored live throughout an event. This is a significant aspect as Aircraft Rescue and Fire Fighting (ARFF) mobilization and routing of critical emergency response equipment can require assistance for longer than the life of a typical sUAV power source (National Academies of Sciences, Engineering, and Medicine, 2019).

Along with the application of drones in response to an emergency, there is a potential for drones to be used to help prevent certain emergencies from taking place. Bird strikes are a hazard for taking off and landing at airports and have the potential to cause substantial damage to aircraft. The most notable of these incidents in the recent past was US Airways flight 1549, also known as The Miracle on the Hudson. In this crash, an Airbus A320 hit a flock of geese shortly after takeoff

and had to make an emergency landing in the Hudson River (Tikkanen, 2009). According to the International Civil Aviation Organization (ICAO), 90% of all bird strikes happen during takeoff and landing. New drone technology has proven to be a safe, cost-effective way for airport operations to manage wildlife on the airfield. An example of one such drone system is the RoBrid. This UAV is a remotely operated, robotic peregrine falcon that not only scares birds off the airfield, but claims to even have the ability to lure flocks away from the airfield. Repeated use of drones for bird management has also shown to reduce the tendency of birds to use glide paths as nesting sites. This evidence suggests that adding drones to existing wildlife management practices, such as removing sources of food and water from the airfield, can prove to be more effective than without the use of drones (Marcellin, 2020).

Airfield Operations Manager at Savannah Hilton Head International Edwin Rahn explained that the current system of wildlife management is not only time consuming, but can be a safety hazard. "Here in the South, we have snakes, alligators, fire ants, and spiders. And if someone doing wildlife mitigation inspections is wearing hip waders and they fill up with water, the person can easily drown," Rahn stated, "But a drone can fly over an area and take a detailed look from the air, instead of, for instance, taking several hours or even a full day to go in and locate a beaver dam, we can bring back drone footage and analyze it without traipsing around a swamp." (Wysocky, 2018 p.1).

It is predicted drone use will continue to grow in the future (Joshi, 2019). In addition, the costs of running airports will continue to rise as long as the public continues to travel by air (FAA, 2020). Drone intervention plans should be a serious consideration for all airport managers and operations specialists moving forward if managers wish to be proactive rather than reactive. The incidents at the Gatwick airport may be described as a reactive approach to drone intervention.

Had a drone intervention plan been in place at the time of this incident, could thousands if not millions of dollars have been saved, and could thousands of passengers been spared from major disruption? And although it is difficult to say whether drones could have been used to prevent the US Airways 1549 incident, could wildlife management with drones have been used to help reduce the presence of birds around airport the LaGuardia airspace? For these reasons, among others, small Unmanned Aerial Systems must be a necessary consideration in the future of airport operations and aviation management.

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