The Impact of Drone Technology on Healthcare

Drone technology has grown from a kitschy hobby to a multibillion-dollar industry in less than a decade. This trajectory of growth is nearly unparalleled in other industries. As drone technology has become more omnipresent in everyday life, its impacts are being felt in almost every major industry – including the healthcare industry. Healthcare providers are currently experimenting with drone technology to quickly transport medical samples, blood, and even vital organs. Companies are also conceptualizing and testing drones that provide tele-medicine services, supply cardiac defibrillators, and transport critical care patients. The applications for drone technology are seemingly limitless, but the potential legal pitfalls are relatively uncharted. This paper and accompanying presentation will provide an overview of the state of drone technology, the regulatory and legal issues in utilizing drones, and the current and proposed uses for drones in healthcare.

What is a Drone?

A drone is an aircraft that does not have a human pilot onboard. It can be controlled remotely by a human pilot, or autonomously by a computer system. Drones are also commonly referred to as Unmanned Aerial Vehicles (UAVs) or Unmanned Aerial Systems (UAS). Drones care range from a few ounces to several thousand pounds depending on the intended use.

The Increasing Prevalence of Drones in Society

Drones are becoming more prevalent each passing day, and they are becoming more prevalent for a host of different reasons. However, two of the main reasons are the decreasing costs associated with the technology, and the government's prioritization of drone integration into the national airspace.

On the cost factor, drones and drone-related services have become readily accessible to the mass consumer market. An individual can now purchase an affordable drone online or at a local toy store, and the drone is immediately ready to fly. An individual can also easily hire a drone photographer to photograph a piece of real estate or a special event.

The federal government has also acted as a major catalyst in increasing the prevalence of drones in society. In 2012, The federal legislator passed the Federal Aviation Administration (FAA) Modernization and Reform Act (FMRA), which mandated that the Secretary of Transportation "develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system." The FMRA established timeframes for developing and implementing the "comprehensive plan," agency rulemaking, and reporting to congress in order to facilitate drone integration into the national airspace. As part of the FMRA, congress identified several testing facilities throughout the United States to research and test drone technology. The information gathered from these sites is shared with the FAA to allow the agency to make recommendations to improve data quality and operational consistency for drones.

Drone Usage Today

Currently, there are over one million registered drones in the United States. This figure includes 878,000 hobbyists drone registrants, and 122,000 commercial/public drone registrants. By comparison, there were approximately 320,000 manned aircraft registered with the FAA as of 2016. This is a staggering figure, especially considering that the FAA has only required drone registration for the past few years.

Several industries have begun using drones as part of their business model and have been able to reap considerable benefits. For example, the agriculture industry has started to use drones to survey potential field plots, monitor crop conditions, and apply pesticides. This has increased the productivity of commercial farmers and has held to increase crop yields. The construction industry has also used drones to survey worksites and infrastructure in order to provide real-time status updates to clients. The sports and entertainment industry has used drones to provide aerial camera footage for sporting events and to start drone racing leagues. And, in the area of public health and safety, various law enforcement agencies and fire departments have used drones to monitor dangerous situations and locate missing persons. The practical applications for drone technology extend far beyond the conventional photography and videography uses.

The Drone Economy of the Future

Various drone trade associations have estimated that the global drone market is currently worth $11.3 billion. These same groups postulate that the global market will continue to increase over the next decade and reach an estimated value of over $140 billion. In order to prepare the workforce for this burgeoning area of development, colleges across the United States have started offering courses and degree programs related to drone technology. For example, Embry-Riddle Aeronautical University now offers a Bachelor of Science in Unmanned Aircraft Systems Science, Kent State offers a minor in Unmanned Aircraft Systems, and Purdue University offers a Bachelor's degree in Unmanned Aerial Systems.

Types of Drone Uses – Recreational use v. Commercial use

In the United States, the FAA distinguishes between two main types of drone uses – recreational and commercial. Generally, recreational drone uses are not compensable, and include flying a drone for enjoyment or hobby purposes. Commercial drone uses, on the other hand, are for profit, and include operating a drone for work or for compensation. Based on whether a drone is being flown for recreational or commercial purposes determines the regulatory constructs that govern the operation. In other words, you can have identical flight paths for recreational and commercial flights, but the regulations applied to each are different.

Other countries throughout the world have adopted a risk-based analysis for drone flights. Meaning that the potential risks of the drone flight would be evaluated under the same

regulatory scheme, regardless of whether the flight was for recreational or commercial purposes.

Recreational Drone Use

In the United State, recreational drone use is governed by section 336 of the FMRA. Section 336 requires that a drone operator register the drone with the FAA if it weighs between .55 lbs. (8.8 oz) and 55 lbs. If the drown weighs less than .55 lbs., then the drone does not have to be registered. But, if the drone weighs over 55 lbs., other registrations and regulatory constructs may apply. Section 336 also generally requires that drone operators follow community-based safety guidelines and fly within the programming of a nationwide community-based organization. An example of such an organization is the Academy of Model Aeronautics. Section 336 also requires that drone operators fly within their visual line-of-sight, and that they never fly near other manned aircraft. Additionally, recreational drone operators must notify the air traffic control of any airport or airfield within a five-mile radius prior to flying.

Commercial Drone Use

With respect to commercial drone operations, these flights are regulated under 14 CFR 107 (also known as "Part 107"). These regulations are far more extensive than the Section 336 requirements. Part 107 governs who may commercially operate drones, the type of drone that can be operated, as well as how, when, where, and to what extent a drone may be flown. The following is a general overview of the rules and restrictions related to commercial drone use.

Commercial Drone Operator Requirements

Under Part 107, a commercial drone operator must:

- be at least 16 years old;
- be able to read, speak, write, and understand English;
- be in a physical and mental condition to safely operate a small drone;
- pass the initial aeronautical knowledge exam at an FAA-approved knowledge testing center; and
- Pass Transportation Security Administration (TSA) vetting.

Commercial Drone Requirements

Under Part 107, a commercial drone must:

- be registered with the FAA; and
- cannot exceed 55 lbs (including payload).

Commercial Drone Operation Requirements

Under Part 107, a commercial drone must operator must fly within the following constructs:

- fly in Class G airspace;
- keep the drone in sight (visual line-of-sight);
- fly under 400 feet;
- fly during the day;
- fly at or below 100 mph;
- yield right of way to manned aircraft;
- do not fly over people;
- do not fly from a moving vehicle; and
- do not perform carriage of property for hire (only provision that can't be waived under Part 107).

Waivers for Certain Commercial Drone Operations

Although Part 107 limits large swaths of commercial drone activities, the FAA has enacted systems for requesting airspace and activity waivers. As of September 18, 2018, the FAA completed the rollout of the Low Altitude Authorization and Notification Capability (LAANC) program, which allows commercial drone operators to obtain near real-time airspace authorizations from the FAA through digital services providers. Kittyhawk is one of these providers.

However, in order to obtain a commercial activity waiver, an operator must request the waiver through the FAA's website and follow these steps:

1. determine whether an "authorization" (good for up to 6 months) or a "waiver" (good for 6 months and beyond) is needed;
    a. Waivers will likely take the FAA longer to review than authorizations;
2. fill out the information that is specific to the type of waiver needed (i.e. operating a drone at night); and
3. submit the waiver application and wait to hear back from the FAA.

The FAA may approve, deny, modify, or request more information for the application. The typical waiver request process takes approximately 90 days, but it may take longer given the complexity of the waiver requested.

Drones in Healthcare

As of recent, drone technology has started making a significant impact in the healthcare industry. With respect to healthcare drones in the United States, as of March 2019, the drone company Matternet partnered with UPS to begin delivering medical samples to the WakeMed Hospital in Raleigh, North Carolina. Previously, medical samples were sent to WakeMed's hospital by courier car. However, now medical samples and can be delivered by drones on the same day, which translates into better patient experiences and lower costs.

Additionally, in 2018, a physician at the University of Maryland Medical Center successfully tested the transportation of a kidney by drone. The successful results of the drone delivery tests were subsequently published in the IEEE Journal of Translational Engineering in Health and Medicine. Additional tests are planned for 2019.

Abroad, the drone company Zipline has been successfully delivering blood supplies to remote parts of Rwanda for over two years. Currently, it is estimated that Zipline has made approximately 11,000 blood deliveries by drone. Zipline is also currently setting up a drone delivery site in Reno, Nevada, to expand operations in the United States.

In Stockholm, Sweden, drone researchers deployed a drone equipped with an Automated External Defibrillator (AED) from a firehouse in response to emergency calls involving cardiac arrests. The drone deliveries took place between 2006 and 2014, and the researchers found that the drones beat EMS responders during every deployment. In fact, the drones reduced the response time for EMS by sixteen minutes.

In addition to the above-reference uses, there are several conceptual uses for drones that have been proposed for the healthcare industry. However, only time will only tell if these concepts find their wings and get off the ground.