

Commercialization of Unmanned Aerial Vehicles

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Unmanned Aerial Vehicles (UAV's) have finally made their breakthrough into the civilian sector of commercialization. For years UAVs have only been used for military purposes, but now with the recent up rise in popularity from the general public we may just see how universal this technology can be. This study will illustrate the history of UAVs and what advancements have lead to the present day technology that is making the commercial use of drones even possible, as well as what we can expect in the future. More importantly though, I am going to go into extreme detail on the potential commercial uses of UAVs, the benefits of incorporating them in our everyday life, potential downfalls, and how I believe the best course of action to integrate them into our airspace.

Intuitively one would think UAVs are a relatively new technology, or this technology was recently incorporate into our military, but the fact is UAVs were around even before heavier than air aircraft was invented. The first type of UAV that the United States military put into commission was in 1863. According to the Air & Space Smithsonian, "the Union and Confederate armies both used an unmanned balloon created by Charles Perley to drop bombs on the enemy" (Darack, 2011, p. 1). This balloon was designed as a split basket that had a fuse on it, and once the fuse expired the basket would open dropping the bomb. This UAV was not very accurate since it was determined by the lift of the balloon and a ruff estimate of the wind and how much fuse to use in order to drop the bomb in the general area of the enemy.

There was several more UAV's from that point on that has been introduced into the military for a variety of applications. For example, the first heavier than air UAV was

the 1918 Kettering bug, which the Air and Space Smithsonian claims, “had a range of 75 miles and the onboard computer counted engine revolutions to gauge the distance before it jettisoned itself into the target” (Darack, 2011, p. 2). From that point on there was several UAVs used for aerial targets such as the OQ-2. There was also UAV’s used in WWII such as the Fu-Go balloons that, “Japan built for the intention of starting forest fires in the United States” (Darack, 2011, p. 4). The most popular and successful UAV in WWII though was the V-1 Buzz Bomb that the Germans created. This aircraft was only good for one flight since it jettisoned itself and the “2,000-pound warhead” into the target (Darack, 2011, p. 6). Finally, in 1952 the advancements grew even greater and the uses of UAV’s changed from targets and weapons to vital reconnaissance aircraft. The technology from the past advanced rapidly throughout the years as different unmanned systems were created, such as the 1955 RP-71 and the 1970 AQM-34, which paved the road to a much more advanced system known as the RQ-1 predator. This UAV According to Air & Space Smithsonian, “was developed by Abraham Karem of Israel and is still in use today for patrols along the U.S. and Mexico border, as well as designed to do long reconnaissance work and shoot air to ground missiles” (Darack, 2011, p. 9).

The present day UAV’s are above and beyond the 1994 predator and there have even been advancements to make smaller, lighter, longer lasting UAV’s available to the general public. The military sector still dominates the UAV sector with the highly advanced RQ-4 Global Hawk made by Northrop Grumman. According to the Air & Space magazine, “the RQ-4 can fly for more than 32 hours and loiter at altitudes as high as 65,000 feet with the ability to see through clouds, dense fog, haze, and dust storms” (Darack, 2011, p. 10). The RQ-4 is technologically superior to the previous UAVs and

with these abilities there is no need to ever risk the lives of pilots in hostile territories on reconnaissance missions again. The popularity of UAV's has created a new market into the civilian world today. There are several small aircraft that can be remotely flown from several hundred feet away up to a few miles depending on how much the individual is willing to pay. These UAVs offered to the public can also be preprogrammed to fly routes and are equipped with a camera and gyroscope to stabilize the camera and can capture live feed along the route that is transmitted back to the pilot on the ground.

These smaller UAV's, which are available to the civilian population, has also augmented endless opportunities for future commercialization. UAV's uses can be limited to something as esoteric as crop management, aerial photography, package delivery, or as complex as search and rescue, ground mapping, and even gathering information within hurricanes. There are several uses the UAV industry is exploring as explained by Majumdar's article where he states that, "commercial drones has the potential to transform many industries and insurance is one of them" (Majumdar, 2014, p. 1). He goes on to talk about how insurance agents can be on scene of an accident and gain all the information needed to create a claim without even leaving the office. Another industry that UAV's could be very vital to is farmers. According to Robertson in his article he states, "drones may help detect crop problems at an early stage," which in return will help the farmer take the correct preventive action to fix the problem (Robertson, 2013, p. 1). This will help the farmer achieve the maximum output of his crops and lead to better yields and earnings once harvest comes. UAV's can also be used in law enforcement when helicopters are not available and still be able to get an overall view of the situation. One example, wildlife management authorities could utilize a UAS

to potentially catch poachers and manage game more efficiently. Amazon even stated, in the CBS News article that, “within the next 5 years they want to be able to deliver packages to the doorstep of their customers within 30 minutes of them ordering the merchandise” (Amazon drone deliveries coming soon, 2013, p. 1). There are just an infinite amount of uses for UAV’s commercially.

The UAV’s are adding a special touch to all different types of careers even here in Oklahoma. Just recently for example, realtors have started using them to take their customers on a virtual tour of land that they are interested in buying without tracking through several acres on foot. They have even put videos online that are available for their customers to see without even leaving the house. This saves them time and money when it comes to having to show one customer several properties by foot. While on the other hand professional sports have even started using them to get that exact angle they need for the best quality footage of the event. There was even UAVs at the professional bass fishing tournaments, which alleviated the camera boat from interrupting the fisherman from catching fish. According to Charles Johnson in his article “ media boats used UAVs to capture unique and somewhat impressive shots of anglers in action at the Bassmaster Classic on Lake Guntersville” (Johnson, 2014, p. 1). Unfortunately, when there are so many ways to use drones out there some are going to abuse the privilege. A recent article by Kristina Davis of the LA Times reported, “the limitless uses of UAVs the cartels are also exploring all their options with drug smuggling” (Davis, 2015, p. 1). Two people from the cartel got caught recently trying to smuggle drugs into the United States from Mexico by using a UAV. This has had the police and border patrol on edge with this new innovation.

According to Mermelstein (2015) the FAA made new draft rules for UAVs available to the public in February of 2015. She stated that, the regulations are similar to pilots, but with a few added regulations. The regulations fall under title 14, as for all other aircraft, and the new regulations were added in the existing part 107. The article further explained a few of the main differences were UAV's have to be less than 55 pounds, fly no higher than 500 feet, and be within sight at all time. The UAVs also may not be flown from another moving vehicle other than a boat and cannot fly more than 87 knots in a controlled airspace. Additionally, the pilot has to take a written test and must retake it every two years rather than a bi-annual flight review a pilot has to complete. (p. 1).

This recent spike in UAV use by civilians, whether their intentions are good or bad, leaves the FAA with no choice but to revamp the existing restriction to keep the airspace safe. So the Department of Transportation added on to the existing regulation from February with more in depth regulations. The U.S. Department of Transportation article states what, "is considered a UAV and model aircraft with detailed descriptions on what is required of the pilot when operating in different classes of airspace" (Unmanned aircraft operations in the national airspace system, 2015, pp. 1-6). These new regulations really cleared up a lot of confusion with what was expected of the pilot in command, as well as what was considered a UAV compared to a model aircraft. Lois's article and U.S. Department Of Transportation policy, put out last month, is a condensed version of the regulations a UAV pilot needs to be familiar with in order to legally fly, but there is a vast amount of knowledge they must be accustomed to before taking flight.

These new regulations are just the tip of the iceberg when it comes to the future of UAVs in our airspace. With the spike in popularity in UAVs throughout the world this has really got a lot of people thinking a lot bigger than just small-commercialized UAVs. In the near future the FAA is going to have to deal with how to integrate larger cargo and even passenger unmanned aircraft into the national airspace. According to Jen Judson's article, "the Army wants industry guidance on future unmanned cargo aircraft" (Judson, 2011, p. 1). She simply states that the army is looking for, "an unmanned aircraft that can fly a range of 300 miles at 250 knots with the capability of carrying up to 8,000 pounds and to fly in less than ideal conditions" (Judson, 2011, p. 1). This is just the beginning for once the army can accomplish building this aircraft and safely operate and avoid traffic in controlled airspace; then it is just a matter of time before civilian airlines and cargo carriers are going to be looking into restructuring the way their aircrafts are piloted.

The public approval of UAVs being used commercially is extremely high, and it should be for all the benefits these devices bring to the table. There are so many ways UAVs can increase the productivity of the general public as a whole, such as what this study articulated earlier in this paper, and still there are so many undetermined uses for this device in the future. The following will focus on what the three main benefits UAVs offer to the general public as a whole in the commercial environment, which are enhancing the safety of the public, scientific research, and making everyday jobs more cost effective.

The safety of the public is absolutely essential here in the United States and UAVs can offer the optimum situational awareness for first responders and law enforcement agencies need. According to the AUVSI article, "less than three percent of

law enforcement agencies have aviation assets” (The benefits of unmanned aircraft systems: saving time, saving money, saving lives, n.d., p. 2). These assets are insufficient for the men and women who put their lives on the line everyday. These UAVs can fill this void and bring the operational awareness to these agencies in a more cost effective way. According to Greg Myre in his article, “ there has been 355 mass shooting just in 2015 with more than 462 casualties” (Myre, 2015, p. 1). This being said, I do not think UAVs will prevent mass shooting, but they will help law enforcement gain the situational awareness needed to take the correct course of action to prevent the least amount of casualties possible. With the recent events of the mass shooting in the United States getting these UAVs to our local and federal law enforcement agencies should be the government’s priority.

UAVs can offer numerous of other benefits to first responders, particularly in natural disaster situations such as hurricane Katrina. These small UAVs can access places that are virtually inaccessible and land in an area other manned aircraft cannot. In hurricane Katrina there were several people stranded on their rooftops for an extended period of time. These UAVs could have distributed survival kits that consisted of water purifying pumps, space blanket, strobe light, and a couple meals ready to eat. This would have given people the necessities to survive till rescue crews could make there way to them. The Mayo Clinic even has plans in incorporating UAVs into their first responder teams as they state in their article; “drones can be used to deliver blood, tourniquets, defibrillators, and other hemostatic supplies ahead of the first responders or to hard to reach places first responders cannot get to” (Medical drones poised to take off, n.d., p. 1). This kind of application can save many lives especially in mass casualty situation.

The application of UAVs for enhanced efficacy is promising for the ability to fly long cumbersome and most of the time dangerous flights. Safety of the pilot and crewmembers is extremely important and unfortunately this has limited the research of certain situations such as hazardous weather and volcanoes. According to Earth's magazine article, "the main scientific uses for UAVs are weather reconnaissance, aerial surveying of natural resources or hazard monitoring" (Oleson, 2013, p. 1). This does not mean these scientist are flying UAVs into a hurricane and hoping to gain as much information as possible before it gets destroyed, but UAVs have allowed them to push the limits more than manned aircraft and have gained some valuable information. For instance, Air and Space Smithsonian pointed out, "NASA flew an Aerosonde UAV into Hurricane Noel and was able to fly as low as 300 feet above sea level in the eye, which was far lower than a piloted aircraft would dare to go" (Darack, 2011, p. 11). The ability to carry multiple weather instruments to these kinds of extremes can lead to a vast amount of unknown knowledge about these natural disaster-causing storms, which in return can save lives.

Every business, small or corporate, number two priority under safety is reducing cost and maximizing profits and this is exactly what UAVs can offer. According to the Economist in his article, "there are several ways in which UAVs can be used effectively to boost the economy through commercial use" (Free the drones; regulating robotic aircraft, 2014, p. 1). The simple fact is UAVs are a lot more cost effective and efficient than piloted aircraft. This aviation asset being more cost effective will not only save businesses and government entities that already use piloted aircrafts money, but it also opens up so many opportunities for other businesses to benefit from aviation. Farmers

will be the first businesses that would benefit the most from UAVs since they can save time and fuel by checking their field and crop production from the sky. Then eventually other businesses like Amazon, which can benefit greatly by being able to send packages directly to the doorstep of their customers within minutes and in return could boost sales. There possibilities are indefinite in ways businesses can incorporate this asset to be more efficient and maximize profits, and may even boost our economy.

The benefits are obviously there for commercializing UAVs in the civilian sector, but this will not be possible without the government entities getting on board with creating regulations, and an aviation infrastructure that will support this. UAVs has been available to the public for a good amount of time and the FAA just got on board with vague regulations this year. There is also confusion on what is considered a UAV according to Brian Elzweig who commented in his article, “ the explanation of a commercial drone in the FAA regulation sounds a lot like a remote control airplane that has been around for decades” (Elzweig, 2015, para. 2). Can a farmer use a UAV for personal use to check his crops and land even though he is basically using it to improve his business’s productivity? Also, UAVs augmented a whole new world when it comes to privacy and as John Villasenor describes in his article, “there is a grey area of what is constitutional in the use of drones by private citizens and government surveillance” (Villasenor, 2014, p. 1). The use of UAVs provides new opportunities, but this should not deter us from reaping the astronomical benefits associated with them.

The first step, in my opinion, to making commercial UAVs possible, as well as productive is to have clear definitive regulation set in place. On top of that UAVs need to be broken down into classes, like manned aircraft are, on weight and performance

capabilities and what is required to operate each class of UAV. Also, the pilots need to take a class with a written/oral exam so they are familiar with the regulations and the airspace they are operating in. Once they have completed this course they will hold a UAV license and must complete future ratings to operate commercially and more advanced UAVs. There also exist a need for a rating for operating in controlled airspace and they must be familiar with talking to Air Traffic Control and filing flight plans if needed with more advanced unmanned aircrafts. Then on top of the FAA regulation to operate a UAV there must be laws set in place that address the privacy issue and what is constitutional. This issue need to be brought up on the federal level, specifically to the supreme court where they need to decide what new laws need to be in effect and what constitutional ways the government can put this technology to use in different agencies.

The second step in my plan in commercializing UAVs would lead to the need of revamping the national airspace to accommodate UAVs and manned aircraft to safely operate in the same airspace. The FAA would need to incorporate UAVs into the flight service stations by branching out a separate service station that deals specifically with UAVs. This station will be available for UAVs operating in controlled airspace and be there for UAV pilots to file flight plans so they can safely operate clear of traffic whether being piloted or preprogrammed to fly a certain route. Airports would have to be available to larger UAVs that need a runway to land; but the pilot would have to be operating the aircraft in this airspace, and keep continuous communication with Air Traffic Control. There will need to be designated altitudes not only for manned aircraft on certain headings, but also UAV altitudes. The maps will need to consist of UAV designated routes along with manned aircraft. Then the last and most important issue

would be a new instrument for all aircraft that will provide the UAV with knowledge of traffic. The see and avoid way of flying in visual flight rules is not enough for a UAV with today's technology to avoid traffic. According to the SEE and Avoid Comparison article, "it was clearly evident that the pilots in manned aircraft were consistently identifying traffic before the camera system" (Kephart & Braasch, 2010, p. 41). This infrastructure is based on avoiding other aircraft at all cost, but there is nothing better than the ability to have an instrument in place just for the event that an aircraft is off route. This would be an extreme revamp of the national airspace, but with the growing number of UAVs there needs to be a system that can safely accommodate both UAVs and manned aircraft.

The use of UAVs has finally made the breakthrough into the civilian sector and has ultimately changed aviation dramatically and will continue doing so in the future with its limitless capabilities of accessing the sky anywhere at anytime. This is not a new concept for it has been around before heavier than air flight existed, but new technology has grown from kamikaze weapons of the past and brought us to the present day civilian commercialization of these aircraft. This technology brings a new era in aviation, and if we want to continue moving forward in the future we will have to revamp our aviation infrastructure and regulations in order to reap the remarkable benefits.

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