**Drones**

**Challenges and Opportunities**

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**Letter of Transmittal**

The purpose of this report titled “Drones” is to detail some of the challenges and opportunities which drones and UAVs place upon the mainstream consumer. This report was written based on secondary research using sources such as peer-reviewed articles, websites, hardcover books, and eBooks, and was conducted over the spring 2015 semester at UNCC. Area 49 has written this report upon permission from Dr. Helen Waite from Technology Advisory Group.

The results from this report show that Drones can have an equally positive as well as negative impact on both society and the mainstream consumers. Privacy, safety, and price point are among the challenges to which drones impair the consumer. These concerns are of utmost importance to the consumer and are detailed in the report. Disaster relief, emergency response, delivery, and agricultural applications are some of the few opportunities that drones grant to consumers. The report details these benefits through past studies and real life applications.

Although this report fully details some of the challenges and opportunities which drones apply to consumers, it is only a small amount of information to which the consumer should base a decision on according to drones. It is in the best interest for the consumer to make his or her decisions about drones using this report as a starting point to conduct further personal research.

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# Executive Summary

This report discusses the challenges and opportunities drones may implement on mainstream consumers.

**Throughout History**

The concept of drones has been around for hundreds of years. In the past, “drones” were balloons that were used in the American Civil War to deploy incendiary bombs. Model airplanes, another type of UAV, were invented and used simply as a form of experimentation to test designs. Today, UAV’s are being implemented in the military as forms of weaponry or data collection, along with aerial surveying of crops and filmmaking. For the future, the hope can only be for drones to expand in the consumer market, to no longer serve as a technology used in the military but as a form of everyday use.

**Drones Pose as a Potential Threat**

Drones in the mainstream market raise challenges for the public. Many consumers are concerned with drones possibly violating their privacy, threatening their safety, or simply if drones are worth spending money on. The topics of safety and privacy begin to raise many questions when associated with drones. Many are concerned with drones being used as a form of surveillance and being recorded without their knowledge or permission. In addition, consumers question if the air space above their homes is considered part of their physical property, and if so, why should they allow another person’s drone to fly on their property.

**Drones Provide Opportunities**

Despite the number of challenges that come with drones in the public market, many of the opportunities outweigh the challenges. Drones are currently or in the process of being used as a form of delivery to send packages or medicines. UAV’s are also being used as a form of weather tracking and emergency response, to help save the lives of thousands of people daily. In addition, drones provide aerial imagery, which presents many opportunities for independent farmers to track issues on their farms without hiring and spending money on labor and equipment to find and fix the issues. The imagery allows for the farmer to pinpoint the exact location of the problem, and through collection of data, can find out what is wrong and what needs to be done in order to fix the issue.

Many of the current or previous forms of technology in the world today have also faced challenges in the beginning phases of being exposed to the public, drones are no different. Area 49 encourages mainstream consumers to continue their own individual research to make educated decisions on whether or not drones should or should not be allowed in the consumer market.

# Introduction

Responding to the increasing popularity of drones, Area 49 conducted research to inform and educate mainstream consumers of the opportunities and challenges that drones present. The report will be introduced to the general public at the North American Technology Expo in April.

Drones are the result of great improvements in technology. Now that drones have become affordable and made its way to the commercial and individual sector, concerns and issues have developed. However, with proper regulations and education, the privacy and the safety of citizens should be maintained while taking advantage of this new technology.

The research report provides a historical overview on drones, including the past, present, and future of drones. An important part of the report is the discussion of the advantages and disadvantages of drones, focused on mainstream consumers. Nonetheless, drones have an important presence in the military sector but Area 49 will not directly cover any of the usages of drones for warfare or military purposes. The usage of drones in the commercial sector will not be directly covered, either.

Area 49 has not conducted direct research. Therefore, the methods used to elaborate this report have been research in several trusted sources such as academic journals, books, and articles. To complement these, Area 49 has used several sources from the Internet, magazines, and other tech related articles.

The research report will begin with the present introduction, followed by a brief historical overview of drones. The body of the research report covers the discussion of the challenges, first, and the opportunities, second, presented by drones for mainstream consumers. Last, the report provides a conclusion containing the summary, recommendations and final statements by Area 49.

## Terms and Definitions

These are some terms and definitions that will help mainstream consumers become familiar with drone technology:

|  |  |
| --- | --- |
| **Term** | **Definition** |
| UAS | Unmanned Aircraft Systems, also known as drones or Unmanned Aerial Vehicles (UAVs) |
| Multirotor Drone | Drone with more than 2 rotors, usually 4, 6, or 8 |
| Aerial Imagery | Taking photographs from the sky, usually with a UAVs |
| FAA | Federal Aviation Association |
| No fly-zone | Area over which aircraft are not allowed to fly |

# Historical Overview

## Drones in the Past

It has not been until recent years that the mainstream public has become familiar with the concept of *drones*,as their uses and affordability have grown exponentially. Although drones seem to be a new technology, the simple concept that lies behind drones is not. Thus, drone is a synonym for Unmanned Aircraft Vehicles (UAVs), and there have been a good number of successful and unsuccessful attempts for many decades.

### Balloons

Balloons were the first unmanned aerial vehicles (UAVs) that we know of.

* The most basic type was the unmanned balloon created by the French brothers Montgolfier in 1782.
* During the American Civil War (1861-1865), the Southern Union used unmanned balloons to deliver incendiary devices on the Southern Confederacy’s army. Its inventors hoped it could carry passengers but that was never accomplished due to the heavy weight of the airplane.
* During [World War II](http://www.airpower.maxwell.af.mil/airchronicles/aureview/1968/jan-feb/conley.html), Japan used unmanned balloons that would fly at high altitude with the hopes of reaching the American coast and deploy incendiary bombs.
* [Genetrix](http://stratocat.com.ar/stratopedia/28.htm) was a program by the United States Air Force aimed to deploy unmanned balloons carrying cameras to obtain aerial images of the Soviet Union, China, and Eastern Europe.

### Model Airplanes

Airplane engineers built model airplanes to experiment and test their designs. These are the most important model airplanes that were, at the same time, UAVs:

* John Stringfellow and William Henson created the Aerial Steam Carriage (a.k.a Ariel) in 1848 in England. It was an unmanned model aircraft with a steam-powered propeller that could fly no more than 60 yards.
* Samuel P. Langley built a series of UAVs being the [Aerodrome](http://www.flyingmachines.org/lang.html) Num. 6 the most successful. In 1896, the Aerodrome Num. 6 flew 4,200 feet staying in the air for approximately one minute.

### Modernization of Drones for Military Uses

The American UAV known as the Kettering Bug supposed in 1918 a big step in the modernization of drones. This aerial torpedo, used by the American Army, could fly on a preset route for about 50 miles. Next, during World War II, the American Army used an unmanned airplane BQ-4/TDR (TDN) to attack and successfully hit 18 Japanese ships.

During the 1950’s and 1960’s the US Navy and Air Force invested a great amount of resources to the improvement of drones for military uses. Advancements in propulsion and guidance systems took place but many UAVs were not totally reliable. At this point, the use of drones was highly questioned by many people. However, this changed in 1982 when the Israeli Air Force used UAVs to destroy 86 Syrian aircraft, maximizing effectiveness and minimizing human losses on the Israeli side. After this success, all countries worked on using UAVs for military uses, which resulted in the constant improvement of drone technology. There has been no armed conflict since the Gulf War in which drones have not played an important role.

## Current Uses of Drones

Like many other technologies, drone technology was mostly improved through the use in the military and ended up jumping into the personal and domestic ambits. In the last years, drones have been used in aerial surveying of crops, acrobatic footage and filmmaking, and even Amazon has attempted to deliver packages using drones. On top of this, many individual consumers have purchased drones for leisure or to explore this technology that’s becoming more and more popular.

Using [drones for hunting](http://www.fieldandstream.com/articles/hunting/2014/03/drone-report-do-unmanned-aerial-systems-have-place-hunting-and-fishing) is a good example on how drones are being used by general consumers. Cy Brown just graduated from the University of Louisiana in Electrical Engineering and, being a habit hunter, decided to attach a thermal camera to remote control airplane. Once the device was in the air, Brown could easily spot prey and communicate the location to his friend. Therefore, the use of a UAV with a mounted thermal camera resulted in improved hunting efficiency.

Using drones for hunting is an application of UAVs technology that results in the improvement of an already existing process. On the other side, many people also use drones for the fun of it. Many people use drones to get aerial pictures while they are traveling abroad, or movies of surfers in the Coast of California. These are probably less serious uses of drones but are contributing to the whole growth and general knowledge of the drone technology.

Last, the Federal Aviation Administration (FAA) is preparing regulations to respond to the increased usage of UAVs by individuals and organizations.

## The Future of Drones

UAVs have experienced a tremendous technological improvement in the last years. This fact has directly resulted in a decrease in price making drones affordable for mainstream consumers. In other words, drones now are not just used in the military by also by companies and individuals.

[Figure 1](http://leaksource.info/2013/11/24/department-of-transportation-report-estimates-250000-drones-in-us-airspace-by-2035/), by the Department of Transportation, forecasts the numbers of drones that will be flying in American airspace for the period from 2015 to 2035. The main conclusion that the graph provides is that drones usage will exponentially increase both in the commercial and the public sectors. The public sector includes the Department of Defense (DOD) and federal, state, and local public agencies. Also, it’s important to point out the Department of Transportation estimates that the commercial use of drones will surpass that of the public sector.

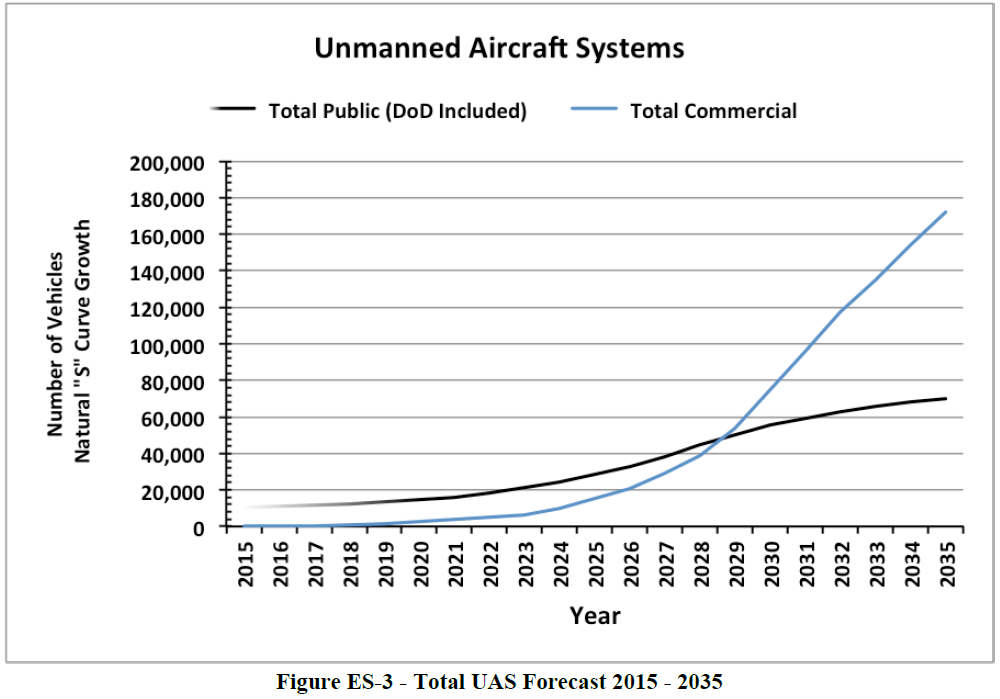


Figure 1: Total UAS Forecast 2015-2035

Besides the public and commercial sector, we expect the penetration of drones in the mainstream consumer market will also increase in the following years. Longer battery life, smaller cameras with higher resolution, and reduction in size and weight, will surely contribute to the increase in the usage of drones for photography and videography purposes.

As the number of drones in American airspace increase, new opportunities and challenges will arouse. The position that the FAA takes will be a determinant factor in the penetration and development of UAVs.

# Challenges

## Introduction

When looking at the emergence of new Drones Technologies in the consumer market, a lot of challenges are presented. Privacy, safety, and price point are three of the challenges presented in this report. In regards to privacy, there are a lot of different issues, ranging from the technology included in droves that could be used for surveillance or recording, to what is considered to be a person’s property. Is the so called “air space” above a person’s house their land in addition to the physical property? If so, how much of this air space? These are just some of the questions being asked. In regards to the question of safety, a lot of people are concerned as to what kinds of threats this new technology may pose. Things like the possibility of a consumer grade drone striking a commercial airliner mid-flight, which may cause damage to the plane or the passengers aboard it if the damage is severe enough. It also has a lot do to with educating those who decide to purchase these drones in their correct use, so they do not hurt themselves or others.

## Privacy

Privacy, especially in this day and age, is always a concern for most American citizens. With things like the Patriot Act and the recent scandals involving the NSA, people are more conscious about who might be looking at their texts or emails, listening to their phone conversations, or looking at where you browse on the internet, then ever. Now, drones provide an interesting new concern in regards to privacy. Some drones the size of golf balls, still have cameras attached to them, as recent technological innovations have allowed for such small cameras they can fit on drones. This enables these drones to take pictures or record video pretty discreetly. Then, with consumer drones becoming more and more popular, the question of what now counts as a person’s property in addition to the physical land they own arises. Do you, as a homeowner, have the right to say that the air space above your house is your property as well? Up until recently, this was not really a concern, as most people were not worried about the spaces above their houses being filled with drones or other technology. Today, however, this is a real concern, and lawmakers are now looking into whether homeowners can claim the space above and around their houses as their property, and how much of that space they can do that with, in addition to creating things like the “No-fly-zone,” which is a voluntary database that allows homeowner’s to sign up so that drones are not flown over their homes. (Zaleski 1).

## Safety

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## Price Point

One of the challenges which drones place on society is price point. Drones outside the toy class are expensive and a relatively new technology. Are drones economically feasible for the mainstream consumers? Will benefits from UAV’s outweigh the steep price tag? Three different models are compared here to help the consumer make an educated decision.

The first UAV model is the DJI Phantom. It is available for purchase at [B&H Photo and Video](http://www.bhphotovideo.com/), an online retailer of all things video and photography related. The DJI Phantom has a base price of $1100 and can fly up to 25 minutes on a single charge. It comes with a manufacturer’s 1 year warranty and extra batteries are available for $130.

A popular and chic looking drone, the [Parrot BeBop Drone](http://www.bhphotovideo.com/) has a base price of $900 and is available from the same retailer. The controller for the Parrot BeBop is included, however it requires a Wi-Fi enabled Android or IOS device which is not included. The Parrot BeBop has a flight time of 12 minutes on a fully charged battery. Extra batteries are $55 and a charger is $45, both of which are not included. It comes with a 1 year limited warranty to which no specifications were found.

The third and most expensive model is the [Walkera Voyager 3](http://www.walkera.com/en/). It has a sleek yet rugged design and features retractable landing gear. It’ base price is $2400 and an extended 3 year warranty is available for $240. The Voyager 3 boasts a professional camera mounted on a 360 degree rotating gimbal. It comes with a radio controller which features a LCD screen but can also be controlled using a Wi-Fi enabled tablet.

The above mentioned are just three of the options a consumer could use to weigh their opinion in purchasing drones. Other factors as well play an important part in the consumers’ decision. All drones are subject to repairs, software updates and compliance with the law. Also a consumer has to feel the benefits would outweigh the high flying prices. Ultimately it is up to the consumer whether he or she would benefit from the purchase of a drone.

## Challenges Conclusion

With the growing emergence of drones and UAVs in mainstream society, there will always be challenges facing the consumer. These concerns are only addressed properly when the consumer is well informed to make an unbiased opinion. Privacy, safety and price point are only three of the concerns that face society today. Mainstream consumers must weigh these challenges against the opportunities to make their decisions, as well as to persuade lawmakers to make the right choices when regulating drone usage. Drones will soon be an integral part of society, but it is up to the consumer to choose how they will hinder or help society.

# Opportunities

## Introduction

The use of drones as forms of delivery, emergency response, or for aerial imagery, presents numerous opportunities for the mainstream consumer. This section of the report presents these opportunities along with some examples of how drones can impact society positively.

## Amazon Prime Air

As a form of delivery, drones can be used to distribute packaged goods purchased online, to a customer’s home within a span of thirty minutes; medicines and emergency equipment can also be transported via the use of drones. [Figure 2](http://www.suasnews.com/2014/10/31577/drone-delivery-by-the-numbers/) shows the top five items consumers would want delivered within 30 minutes.

Figure 2: Top five items consumers would like delivered within 30 minutes.

Many people have become accustomed to online-shopping. In May of 2014, [Amazon](http://www.fool.com/investing/general/2014/05/24/how-many-customers-does-amazon-have.aspx) had roughly 244 million active customers on their site, and surely that number has only continued to increase since then. Amazon’s customers are drawn to the company’s option of “Prime Delivery,” which allows packages to be shipped and delivered two days after a purchase is completed. With that said, Amazon plans to take Prime to the next level with Amazon Prime Air[[1]](#footnote-1).

Amazon Prime Air is Amazon’s future delivery plan that will deliver packages to customers in 30 minutes or less using UAV’s. According to an [interview on CNN](http://www.cnn.com/2013/12/02/tech/innovation/amazon-drones-questions/), at the moment Amazon’s octocopter’s will have a 10-mile radius from an Amazon distribution site. Items up to five pounds will be transported at an altitude of 300 feet to ensure the items remain safe from potential shooters or thieves.

## DHL

Along with the delivery of online purchases, DHL, an international express mail service, plans to provide faster medicine delivery methods using parcel copters. A [press release](http://www.dhl.com/en/press/releases/releases_2014/group/dhl_parcelcopter_launches_initial_operations_for_research_purposes.html) issued on Sept. 24, 2014, discusses DHL’s plan to launch a parcel copter containing medication and other needed goods from the island of Juist to a harbor in Norddeich. This method of delivery will mainly be used in times when other forms of delivery (ferries, flights) are not available. Residents and/or tourists can place orders on specific medications or needed goods, when an alternative delivery method is unavailable.

Starting off in just one area of the world, this project can be picked up all over the world. The use of drones to transport medicine will allow mainstream consumers to have access to medication or other needed goods, faster than any other method.

## Natural Disasters/Emergencies

Having a better understanding on the formation of storms, allows officials to swiftly make life or death decisions. Sending drones into violent storms allows for early detection which can save thousands of lives. [NASA](http://www.smh.com.au/technology/sci-tech/nasa-sends-drones-to-track-hurricanes-secrets-20130916-2tufm.html) plans to send UAV’s into storms to look for warning signs to adequately detect when a storm will hit a specific area.

Currently, the [amount of time](http://www.accuweather.com/en/weather-news/drone-weather-safety-prediction/27739091) between when a warning of a violent storm is issued, to the time the storm occurs, is 20 minutes. With NASA’s plan to send drones into these storms, that time can be expanded to 60 minutes. A longer warning time can save thousands of lives, and can give people ample time to evacuate or protect their property. The use of drones in this case allows for consumers to keep themselves and their families safe.

Drones, [unlike helicopters](http://www.cnn.com/2013/05/23/tech/drones-the-future-of-disaster-response/index.html) or other forms of air travel, make little to no noise during flight. Helicopters that fly over damaged areas, make too much noise and therefore drown out the cries and shouts for help from trapped survivors. Advanced listening devices can be attached to UAVs to ensure that all cries for help are heard. Drones can collect data from listening devices as well as well as infrared cameras, that are then sent to authorities in order to pin-point exactly where the survivors are located.

## Emergency Response

Emergency response is another area the produces a benefit for the use of drones. The [average response time](http://www.self-defense-mind-body-spirit.com/average-police-response-time.html) from the moment a call is placed, is 10 minutes. In larger cities such as Atlanta, that number jumps to 11-12 minutes. These numbers do not take into account traffic or other occurrences that might affect the time first responders can make it to the site of an emergency.

Alec Momont has created what he calls the [Ambulance Drone](http://www.alecmomont.com/projects/dronesforgood/). This UAV will contain AED’s, medication, and CPR aids, which will be transported to the emergency sites to aid those in need, until emergency personnel can get to the scene. Ambulance drones can assist in treating heart failure, drowning, traumas, and respiratory issues. These drones aim to save lives within the first five minutes after an emergency call is placed. Reducing the average response time in half. Drones do not and will not get stuck in traffic or other occurrences and therefore can actually make it to a scene on time and begin aiding people.

Drones have already been used to assist firefighters in locating missing people in burning buildings. An infrared camera on one drone helped first responders locate an [injured man](http://www.shiftcentral.com/blog/drone-technology-could-have-future-emergency-response) whose car had flipped in the snow. [Lifeguard drones](http://www.dronemag.co/lifeguard-drone/) are also being incorporated at beaches to drop flotation devices to those in need.

Drones would not take or replace the jobs of emergency responders, but will instead assist them to complete their jobs quicker and more effectively. With the use of drones in everyday life, mainstream consumers can know that drones can assist them in times of need.

## Agriculture

Another opportunity drones can offer mainstream consumers is through the use of aerial imagery in agriculture. Many small farms have difficulty gathering and analyzing data from their crops. Currently, most small farmers acquire data about crop health and pests manually by walking in the fields. This is time consuming and makes it hard to catalog data year to year. By utilizing drones outfitted with multispectral cameras, small farms can collect data from an entire field without stepping foot in it. Also this data is recorded and catalogued with software systems so that the farmer can manage his or her crop more accurately from year to year. There are three different studies which prove the use of UAV’s on small farms can have a positive impact by reducing labor and materials.

### Weed Control

At La Monclova Farm in Spain, a drone hovers above an experimental sunflower crop. This drone is equipped with two cameras. The first is a typical point and shoot Olympus model camera. The other is a six-band multispectral camera made by Tetra-cam, a leading company in agricultural imagery. The drone is controlled by a radio transmitter along with a ground station which holds the software program for flight patterns and GPS data acquisition. The experiment took place in May 15th, 2012, 45 days after planting covering an area 100m x 100m. The purpose of this experiment is to identify the emergence of weeds in the crop in order to perform site specific weed control. The drone follows a predetermined flight path over the field taking multiple images. Each flight pattern was performed at altitudes of 30m, 60m, and 100m. Images from each flight path were saved and catalogued according to altitude and gps coordinates and a map of the field was created. Samples of weeds, bare soil, and sunflower were taken and photographed with both cameras. The sample images were studied according to their NDVI, NGRDI, and ExG. This information was used along with the software program to accurately map the field according to bare soil, crop, or weeds.

The experiment found that at lower altitudes, the UAV with its cameras was able to collect high resolution images which were able to discriminate small patches of weeds in the field. However, at higher altitudes the UAV could cover more area with less photographs but the resolution suffered. It was concluded that through the use of a UAV and aerial imagery, that site specific weed control can be applied in order to reduce the use of pesticides. This method was also advantageous in reducing labor in the field. (Stafford).

### Mapping Microclimates

All crops are managed according to the climate which they grow. In hot, dry climates, crops need to be watered more. In cooler damp climates crops need less water, however pests are more abundant. In recent years, farms have begun to map their fields according to microclimates instead of managing the field as one climate. This allows the farm to customize irrigation, pesticide application, and spacing of plants. These microclimate maps are typically made with the use of large, expensive, high-tech tractors which must be manned. This method is usually out of the economic range of farms under 250 acres. So small farms are beginning to use this same technology on an UAV platform.

The University of Hohenheim in Germany conducted a study to [map microclimates](http://link.springer.com/chapter/10.3920/978-90-8686-778-3_18) using a drone over an area of approximately 100m x 50m. The drone was a modified Mikrocopter UAV from [HiSystems](http://www.mikrokopter.de/en/home). It was equipped with an onboard computer called Raspberry Pi as well as temperature and humidity sensors. The Raspberry Pi computer processed readings from the sensors according to altitude and GPS. This information was then sent wirelessly in real time to the base receiver station which was a Lenovo laptop. Recordings from 3 different altitudes of 5, 25, and 50m were taken. Data from the temperature and humidity sensors was then mapped according to altitude. Below is a figure which graphically represents how this information is processed from the drone to the end user.

Figure 3: Shows the process of information

Results from the study show that mapping of microclimates can be done accurately and efficiently through the use of UAV platforms. It was found that at lower altitudes, temperature was greater and humidity was lower. Conversely, higher altitudes had lower temperatures and higher humidity.

### Spatial Harvesting

Currently, there are two methods to determine the ripeness of grapes on the vine. The traditional method is a destructive method which involves pulling grapes from the vine for [testing of anthocyanin](http://link.springer.com/chapter/10.3920/978-90-8686-778-3_23) (a chemical naturally present in the skin of a grape). The higher levels of anthocyanin, the riper the grape. The other method utilizes a Multiplex sensor which measures levels of chlorophyll fluorescence (refracted light from the chlorophyll in the plant). A previous study showed a direct relationship between anthocyanin levels and chlorophyll fluorescence. Anthocyanin levels were high when chlorophyll fluorescence was low and vice-versa. Therefore, the Multiplex sensor can be used to determine the ripeness of the grape. However, both of these methods are time consuming and involve long hours in the field. The following study combines the use of the Multiplex sensor on a UAV platform in an effort to map the anthocyanin content within a vineyard for use in spatial harvesting.

In Catania, Italy, two growing seasons were studied at Valenti winery using aerial imagery from a drone platform. An eight rotor VTOL was equipped with a Tetra-Cam, just as mentioned above in the first study. The Tetra-Cam is calibrated against the Multiplex sensor in order to photograph the chlorophyll fluorescence. The drone is programed to fly autonomously above the vineyard at 150m throughout the 2011 and 2012 seasons. Maps of the vineyard according to the anthocyanin levels were then made periodically during each. These maps are tested against the standard two methods mentioned previously to ensure accuracy.

During both growing seasons accurate anthocyanin maps of the vineyard were able to be made using UAV’s and aerial imagery. These maps were used to harvest the grapes spatially to ensure optimum quality of the grape. Also, it was found that soil content played a much more imperative role in the ripeness of the grapes than climate. The UAV platform enabled the winery to more accurately map the ripeness of their grapes as well as reduce the number of man hours in the field.

## Opportunities Conclusion

Amazon planning to utilize drones for delivery and DHL using drones for medication delivery shows the opportunity drones can implement on society as a carrier platform. Lifeguard drones and UAVs with infrared cameras have proved the lifesaving capabilities which drones possess. Furthermore, drones and UAVs have found to be extremely useful in small agricultural applications as proved in the studies aforementioned. This is all evidence to the positive implications which drones can have on mainstream consumers.

# Conclusion

Drones currently provide many opportunities for the consumer, in addition to presenting some challenges to them as well. Their use in delivery, whether it be from Amazon to deliver small items ordered from them within 30 minutes, or the delivery of medicine in need, is just one example of these opportunities. Others include their use for emergency relief, assisting first responders in a natural disaster or using these drones to scout and estimate the strength and direction of storms before they hit out shores, and Aerial Imagery, which, for example, can be used to help farmers harvest and protect their crops. However, the challenges to consumer drones are there. Safety is a large concern; as drone technology advances, they will be able to fly higher and higher, and we don’t want commercial airlines to be threatened by them, or anyone to be threatened by them, for that matter, though improper use of these drones. Privacy is another one of these concerns. Between the fear of the government using them for surveillance without our knowledge, and whether what is considered to be a breach of our personal property if a drone owned by a neighbor were to be flown over your roof, many are concerned with being watched by drones without their permission. Finally, there is the issue of price point. Many drones can get very expensive, and the question is whether they will eventually get to be affordable for all mainstream consumers, not just the well to do.

Area 49, as our bottom line opinion, supports drones in their current form and moving into the future. They should be available to the mainstream consumer at an affordable price, and the public should be informed of the positive impact drones can have on their lives, because of the mounting evidence of exactly that. We recommend that research to make drones more affordable and consumer friendly be supported and continued, in addition to reaching out to policy makers in Washington to support regulation and legislation that keeps drones something that we all, as a people, can enjoy. Drones can be a positive force in the world, we just need to continue to develop the technology, and eventually, it may become a piece of technology we wish we could have enjoyed sooner.

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1. Current FAA regulations on drones are taking place and might affect the delivery aspect of drones [↑](#footnote-ref-1)