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# Unmanned Ariel Vehicle Sorts with Societal and Security Applications

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***Abstract:*** ***The goal this paper aims to detail exploration about the Unmanned Ariel Vehicle and its types and various application use cases of its. Discuss the Unmanned Ariel Vehicle market growth and regulations. Unmanned Arial Vehicle – generally called as UAV are the cutting edge technology and buzz word in the recent years because of its various potential strength. UAVs are usually called as Drone. As the name implies UAV is the aircraft without a human pilot on the board. Drones are controlled from the ground control system (GCS) or designed to fly autonomously using the defined flight path and flight plan.***

***Keywords: UAV, UTM, Navigation, UAS, GIS***

## I. INTRODUCTION

UAV also called Unmanned Ariel Vehicle which is one of the emerging and growing sector. It is remotely operated aircraft. UAV has many types and in recent days it's playing a key role in defence, border surveillance [1]. It is not only used in the defence sector but also used in much societal application like disaster managing [2], surveillances [3], precision farming [4] etc. Goal of this paper is to discuss in details about drone based application and its market. Unmanned Aircraft System consist of 3 main component namely UAV, Ground control system and communication channel [5]. Mostly small UAVs power by lithium-polymer batteries. System on Chip (SOC), Single board computers (SBC) are different computing methods and technology in the UAV. Movement and position sensor is used to maintain the stability of the UAV. The components of the Unmanned Aircraft System is mentioned in picture 1.0. It has many blocks in its like power supply unit for the fuelling purpose. Sensors for the stability of the UAV. Computation Unit for the computing purpose and etc. GCS also called as ground control station mainly used to control the UAV from the ground using the remote control. Communication from the GCS to UAV happens through the communication channel. Data transfer happens through communication channels.

## I. DRONE REGULATION

Drone application and Drone market are growing in a fast phase. We need proper infrastructure to manage the low altitude airspace. NASA and FAA have initiated to manage the UAS traffic in the name of UTM regulation.

UTM stands for an unmanned traffic management system. It is a concept of managing UAS traffic, operation, data exchange, support a system to enable multiple UAS control beyond visual line of sight at altitudes (BVLOS) under 400 ft. above ground level in the airspace. UTM will provide many services like flight path planning, flight monitoring, avoid dangerous wind condition and weather, airspace design, congestion management and avoidance and emergency planning.

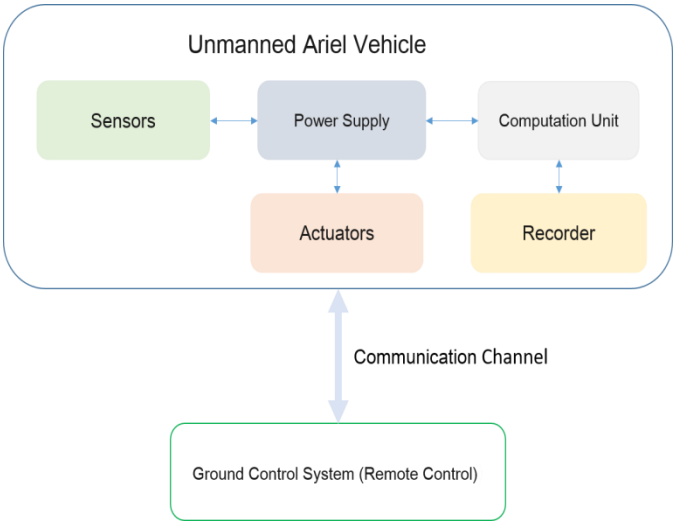


**Figure 1 UAS Physical Structure**

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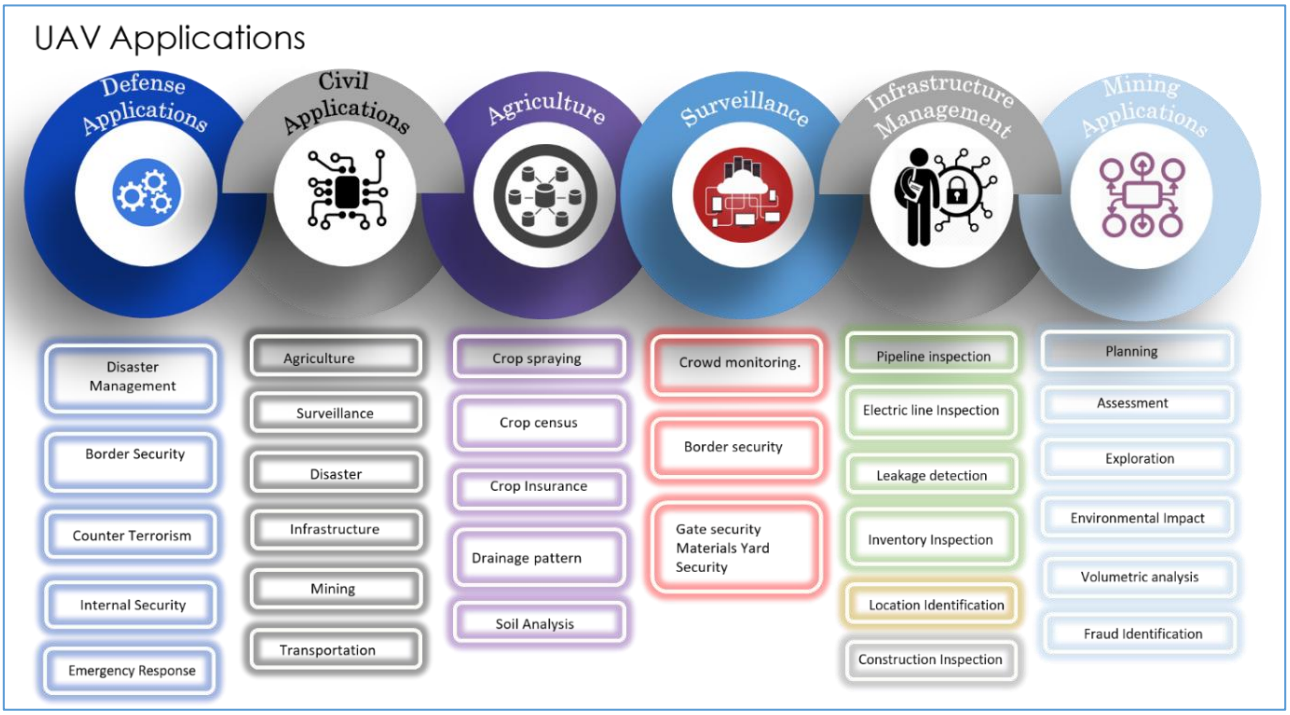


**Figure 2 UAV Based Applications**

## II. UAV BASED APPLICATIONS

Initially, the UAV plays a major role in the defence and military purposes. But in recent days UAV useful in various industries and sectors. In general apart from useful in defence purpose, the drones are useful in different societal application. Defence, Civil, Agriculture, Surveillance, Infrastructure Management, Mining. Disaster Management, Border Security, Counterterrorism, internal security and Emergency Response are a few examples of defence application. The drone is useful in Crop spaying, Crop census, Drainage Pattern, Soil Analysis, Crop Insurance in the agriculture sector. UAV is very useful in crowd control by crowd monitoring. Gate Security and Yard security are the other major features of Drones. UAV are many application use cases in infrastructure management like pipeline inspection, electric line inspection, leakage detection, inventory inspection, construction inspection, and location identification. UAV is very useful to perform Volumetric analysis, urban planning, environmental impact analysis, exploration, and fraud identification for the mining department. Picture 2.0 explains the difference application use cases of drone industries. UAV has many advantages in the transportation system [6].

## III. UAV MARKET STUDY

According to the market study and survey the drone market will grow up to forty-three billion (43 Billion USD) American dollar by 2024. It is almost 20% growth from the 2018 market status. The drone is playing a major role in the energy industries. This will continue and along with that transport industries also get benefit from the drone technology. By 2027 agriculture-based UAVs application will reach up to $450 million [9]. In the future UAV will play a big role in the transportation sector like goods delivery, drone taxi for transporting the people. Currently, the United States and China are the two legends in the drone industries. Together they make a revenue of 67% of the global market. India has a very good footprint in drone industries and its keep growing. Drone sales will expect to grow by 300% by 2014.

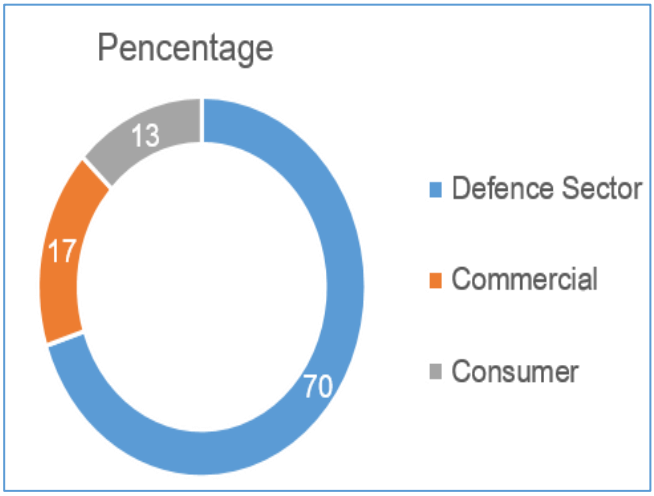


**Figure 3. Market study of Drones by sectors**

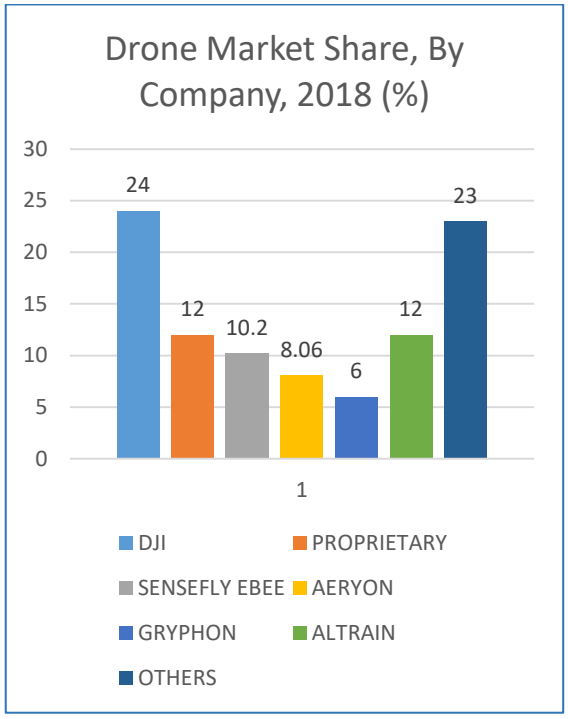


**Figure 4 Drone Market share by company**

## IV. DIFFERENT TYPES OF UAV

There are different types of UAV or there in the market. Each UAV has it is a unique feature and useful based on the specification of the requirements and needs. Based on the type of aerial platform used, the UAV is majorly categorised into four types namely Fixed Wing, Multi Rotor, Single Rotor Helicopter, Fixed Wing Hybrid-VTOL [7]. More classification has been done in [8].

**According to Ariel Platform:**

**Multi-Rotor:** These are commonly used drone which is mainly used for Ariel photography and Ariel video surveillance. It is easy to manufacture and comparatively cheaper in the price. It's further classified into multiple subtypes like Tricoptor, Quadcopter, Hexacoptor, and Octocopter. Multirotor has some drawbacks like a limitation in flying time, endurance and speed constraints. Multi-rotors need more energy to float on the air.

**Fixed Wing:** These drones have decent flying time capacity compared to the Multirotor. It does not need more energy to float on the air compared to the multirotor. It is good with travel for a longer distance. Because of its higher-flying time and fuel efficiency, it is best suitable for long-distance application like mapping or surveillances. On the other hand, fixed wings are not suitable for Ariel photography as it cannot stand still on a specific point. It is expensive than the Multirotor and we need to be trained pilots to operate the fixed-wing drones.

**Single Rotor:** These drones are very similar to Helicopter in design. Compared to multi-rotor these drones are much efficient and good in flying time. The gas engine can be the source of power for the single. It is more stable as it has only one rotor. Since the blade size is huge, the impact will be heavy when in case its meet with an accident.

**Hybrid VTOL:** It is a hybrid mixture of rotor based model and the fixed-wing. Fixed-wing is used for the higher-flying time and rotor based model for the hover purpose. Accelerometers and Gyros in this drone is used to keep the drone with more stability. Comparison of these drones has given in details in table 1.0.

**According to Size:**

Based on the size UAV are classified into 4 types called Very Small Drones, Mini Drone, Medium Drone and Large Drone.

**Very Small Drone:** These drones are also named as Nano drone. These drones are very small in size and majorly used for spy purpose. It is very small in size and can fly even to a small place. It looks like an insect and a centimetre in size.

Small Drone:

These drones are smaller in size. However, compared to Nano drones these drones are bigger. Size of these drones will not exceed 2 meters.

**Medium drones:** It is bigger and can lift two hundred kilograms. It is heavy to lift by a human.

**Large Drones:** These drones are heavier and larger than the medium size drones and mainly used in the defence sector for the surveillances.

**Table 1 Comparisons of Drones on Ariel platform**

| Type | Advantage | Disadvantage | Application Use case |
|---|---|---|---|
| Multi Rotor  | • Ease to operate and fly<br>• Less expensive | • Fewer flight times<br>• Short endurance | Good for Ariel Photography and Ariel surveillances |
| Fixed Wing  | • Long endurance<br>• Larger distance coverage<br>• High in Speed | • Expensive<br>• Need training to operator | Good for Ariel mapping, Pipeline and powerline inspection |
| Single Rotor  | • Long endurance<br>• High Payload capacity<br>• High in Speed | • Expensive<br>• Need training to operator<br>• More dangerous | Ariel Laser Scanning |
| Fixed Wing – Hybrid  | • Long endurance and<br>• Hover | • Not matured | Drone delivery |



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## V. CONCLUSION

This paper presented an organised exploration about a list of UAV's applications and types of drones. UAV's are not only used for defence sector also used in different societal application like agriculture, infrastructure management, mining application, etc. There are different types are drones exist in the market and use for different use case based on its size and design.

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