

Moving Ahead in Future with Drones: The U.A.V's (Unmanned Aerial Vehicle)

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Abstract – Drones are more formally known as unmanned aerial vehicles (UAV). Essentially, a drone is a flying robot aircraft that may be remotely controlled or can fly autonomously through software-controlled flight plans in their embedded systems working in conjunction with GPS. UAVs have most often been associated with the military but they are also used for search and rescue, surveillance, traffic monitoring, weather monitoring and fire fighting, among other things. In this paper, we have discussed about introduction to drones, their construction, three classes of drones, and types of drones, advantages of drones and challenges of drones and future scope of drones.

Index Terms – UAV, GPS, UAS, RPA.

1. INTRODUCTION

A drone is generally used as a military weapon or surveillance tool. It is also referred as an unmanned aerial vehicle (UAV), unmanned aerial system (UAS) or remotely piloted aircraft (RPA). They are aerial vehicles which come in wide varieties, shapes and sizes and can be remotely controlled or can fly autonomously through software-controlled flight plans in their embedded systems working on the basis of GPS. They have carried out various monumental tasks such in preventing terrorist attacks and capturing the important Taliban leaders which includes the supervision of the infamous “Osama Bin Laden”. The concept of drones started in the mid-1800s, when Austrians has sent off unmanned, bomb-filled balloons in order to attack Venice. The drone existing now-a-days has started innovation in the early 1900s, and was originally used to train military personnel. It continued its development during World War I. The use of drones has grown quickly in recent years because unlike manned aircrafts they can stay over for many hours, they are much cheaper than military aircrafts and also can be flown remotely, so there is no danger to the flight crew. A drone can provide a low-cost and low-impact solution to environmental managers working in a variety of ecosystems. The drones used for these purposes are referred to as ‘eco-drones’ or ‘conservation drones.’ Drones can also be used for domestic purposes. Domestic drones have varied capabilities and uses. They are used in numerous fields like hobbyists, commercial and industrial, agricultural, safety and law enforcement.

2. CONSTRUCTION OF A DRONE

A drone is made up of light composite materials to reduce weight and increase position changing capability. Due to the

usage of composite material strength allows it to cruise at extremely high altitudes. They are equipped with the infrared cameras, global positioning system (GPS), and laser or GPS guided missiles.



Figure 1: A Drone

The UAV system has two parts- the drone itself and the control system. The trained pilots or programmers control the plane from the ground. The surveillance data is sent to the satellites from which it is received by the ground forces to form the attack strategies and vulnerable areas in the enemy's camp. A military drone along with the control system costs about 50 million US dollars. Drones consist of nose which can be found where all the sensors and navigational systems are present. Rest of the body of the drone is complete innovation since there is no loss for space to accommodate humans and are also light weight. The materials used to build it, are highly complex composites which can absorb vibrations in order to reduce the produced noise. They are also equipped with missiles to provide support to the ground forces.

3. THE THREE CLASSES OF DRONES

3.1. Close Range

Flight time is from 30 minutes to 2 hours, with the speed of approximately 60 kmph. Its weight is less than 5 kg and it can

cover the range of 50km. It can reach nearly 6km in altitude. Its cost is around \$500-\$70,000.

3.2. Short Range

It has a speed of greater than close range drones i.e., less than 485kmph with the flight time as 8 hours-10 hours. Its weight is less than 5,000kg with the cost of \$500-\$8 million.

3.3. Endurance

It has the greatest range with comparison to close range and short range, of 200km with the maximum flight time of 24 hours. Its weight is less than 125 tonnes. Its cost is around \$123 million.

Characteristics	Close Range	Short Range	Endurance
Range	~50km	~200 km	>200 km
Flight Time	30 min-2 hours	8 hours-10 hours	>24 hrs
Weight	<5 kg	<5,000 kg	<105 t
Speed	~60 kmph	<485 kmph	<730 kmph
Altitude	<6 km	<16 km	<20 km
Cost(USD)	\$500-\$70,000	<\$ 8 million	<\$123 mil

Table1: Characteristics of the three general classes of drones

4. TYPES OF DRONES

4.1. ECO DRONES

Eco drones can not only capture images but can also function as a real time monitoring mechanism for disaster events or illegal resource attraction, collect and transmit meteorological data and can also distribute broadcast messages. Drones can fly in areas which are riskier and beyond the reach of humans or manned aircrafts such as inaccessible shorelines or hurricanes. Because of the small size and aerodynamics of drones they can fly at very low altitudes for collecting more precise information than manned aircrafts.



Figure 3: Working with Eco drones & View through camera

4.2. DOMESTIC DRONES

Domestic Unmanned Aerial Vehicles are self-governed that are equipped with high quality sensors and cameras to gather the data from an aerial viewpoint. With the Federal Aviation Administration providing licenses to the government agencies, which are thus increasing the use of drones. They can vary from very small, semi-autonomous rotorcraft to large, fully autonomous aircraft. They operate on batteries due to which their flight time is limited from 15 minutes to as long as 12 hours. Their autonomy lies in the fact that they are able to take off and land on their own with the human control over in flight actions and movements. These are connected to handheld computers on the ground, which allows the operator to observe the drone's flight patterns and gather data. The gathered data

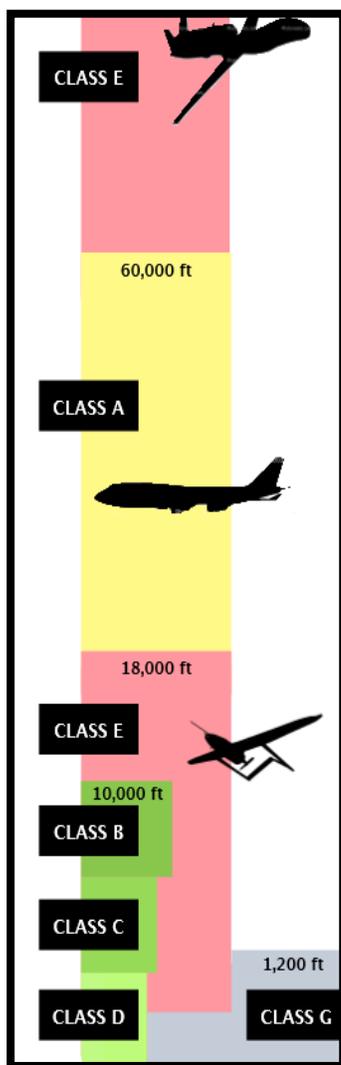


Figure 2: Classes of UAV

can be seen through a display screen on the ground which is connected to a camera on the drone. This allows an operator to maintain control over the drone in flight even if it leaves the line of sight of the operator, ensuring that the drone does not become lost even if it goes off course. The drones that can be used as domestic drones lie at the low end of the spectrum for all categories. This is partially due to cost considerations in choosing drones for domestic municipal program and also due to FAA regulations.

5. ADVANTAGES OF DRONES

- They are lightweight and easy to transport.
- They capture high resolution and low cost images.
- They can fly at variety of altitudes depending on data collection needs
- Can be limited by wind speed and gusts
- They can travel areas which are not accessible via car, boat, etc.
- They are extensively used in rescue operations, helping in delivering medicines and food, providing the live status of affected area, communicating in crisis, etc.
- Quick availability of raw data.

6. CHALLENGES IN USAGE OF DRONES

- Depending on model they have limited flight time
- There are restrictions and air space limitations.
- They can be affected by wind speed and gusts.
- Because of the small image footprint, numerous images must be captured.

7. FUTURE PROSPECTS

Since drones have surpassed the work efficiency and tolerance capacity, so new applications are coming into picture. The British and USA are most vital in UAV development. The new “helicopter drone” released by the US army carries a very high Giga pixel camera to provide clear ground images even from heights (8000 feet approx). The sensors carried in the drones are also being made sharper to provide higher aerial surveillance. Software of the drone is being developed in such a manner that the drone can take its own decision in situations where human error is probable. They are truly an engineering spectacle which contains the best of mechanical, electronics and software technology.

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