

# Unmanned Aerial Vehicles : A Review

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**Abstract—** This Unmanned Aerial Vehicles(UAVs) or Drones as in simple languages are the aircrafts that fly without any human being Onboard. In the last few years this technology have evolved from performing a simple role/mission to multiple role in daily life. Like in Military these aircrafts are used for Surveillance, Monitoring ,tracking and destroying a Target by using Advance technology. On the other hand these aircrafts are used in Search operations whether we have to search for a person or any suspicious objects in a Location. Even Nova sent the Dove to find whether the flood ended or not instead of risking his life by leaving the ark. Similarly in the same way UAVs can be sent to investigate areas without risking the Human life.A distinct advantage of UAVs is their cost-effectiveness. They can be produced and operated at lower costs compared to the cost of manned aircraft. This project is concerned with the development of an Unmanned Aerial Vehicle. What changes can be bought in the design so that it can serve in other fields too. Like Logistics, Transportation and As a support system for the Soldiers in the battlefield.

**Keywords:** Drone, Military, Onboard, Technology, UAV

## INTRODUCTION

The term Drone covers a very broad category of Unmanned aerial vehicles(UAVs) that can be used for anything from military or commercial purpose, to personal entertainment. They are mainly categorised into Two categories :

1. The One used for military purpose are known as Unmanned Combat Aerial vehicles(UCAVs).

2.The one used for personalised and commercial purpose.

But generally both are known as Drones.

In popular culture, when people talk about drones they are frequently reffering to any of a range range

of quadcopters that have become trendy over the last two years.

Unlike regular helicopters, quadcopters have two sets of propellers, making them easier to manœuvre both indoors and outdoors. Further aiding ease of use, modern quadcopters have begun incorporating a range of new technology, including electronic sensors that stabilise them, with some models even controllable via a smartphone app instead of bulky controllers. Some models can even be programmed to fly set paths or patterns.

## Background

The concept of Unmanned Aerial Vehicle started as early as in 1917, The United States military researched and employed unmanned aerial

vehicles (UAVs). Over that time, they have been called drones, robot planes, pilotless aircraft,

RPVs (remotely piloted vehicles), RPAs (remotely piloted aircraft) and other terms that describes

aircraft that fly under control with no person aboard. They are generally called UAVs, and when these UAV system is combined with ground control stations and data links, forms UAS(Unmanned Aerial Systems).

The Defence department defines UAVs as powered, aerial vehicles that do not carry a human operator, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload.

It is to be brought to attention that Missiles cannot be reffered as UAV even if it is also Unmanned. Since Missiles are non recoverable so according to the Department of defence those are not considered as UAVs. Ballistic or semi-ballistic vehicles, cruise missiles, and artillery projectiles are not considered UAVs. UAVs are either described as a single air vehicle (with integrated

surveillance sensors), or a UAV system (UAS), which usually consists of three to six air vehicles, a ground control station, and support equipment.

UAS were first tested during World War I, although at that time they were not used in combat by the United States during that war.

But during Vietnam War the United States employed UAS such as the AQM-

34 Firebee in a combat role. The Firebee exemplifies the versatility of UAS—initially flown in the 1950s as an aerial gunnery target and then in the 1960s as an intelligence-collection drone, it

was modified to deliver payloads and flew its first flight test as an armed UAV in 2002.

Since then there has been a gradual increase in the development of UAVs. For many years, the Israeli Air Force led the world in developing UAS and tactics. U.S. observers noticed Israel's successful use of UAS during operations in Lebanon in 1982, encouraging then Navy Secretary John Lehman to acquire a UAS capability for the Navy. Interest also grew in other parts of the Pentagon, and the Reagan Administration's FY1987 budget requested notably

higher levels of UAS funding.<sup>5</sup> This marked the transition of UAS in the United States from

experimental projects to acquisition programs.

Initial U.S. capabilities came from platforms acquired from Israel. One such UAS, Pioneer,

emerged as a useful source of intelligence at the tactical level during Operation Desert Storm, when Pioneer was used by Navy battleships to locate Iraqi targets for its 16-inch guns.

Now United States leads the table of the Nations using Unmanned Aerial Vehicles with staggering 56% followed by the China with 12%.

#Picture

UAV Design and Architecture

- Design : The design concept used for the manufacture of UAV is that the machine must be light weight and Aerodynamic as much as possible.

Fuselage and Wings for plane, Rotor, canopy and arms for multirotors.

- Material : To make the plane light weight mostly Carbon fibre is used as it is half the weight of steel and twice as strong as it.

- Power Supply : UAVs mostly rely on lithium-polymer batteries (Li-Po), while larger UAVs uses fuel or Solar power as their power supply.

- Flight Control : Flight control is one of the low layer system and not much different from manned aviation. The automatic flight control is itself layered in multiple levels of priority.

UAVs can be programmed to perform aggressive manoeuvres or landing on inclined surfaces.

Telecommunication System

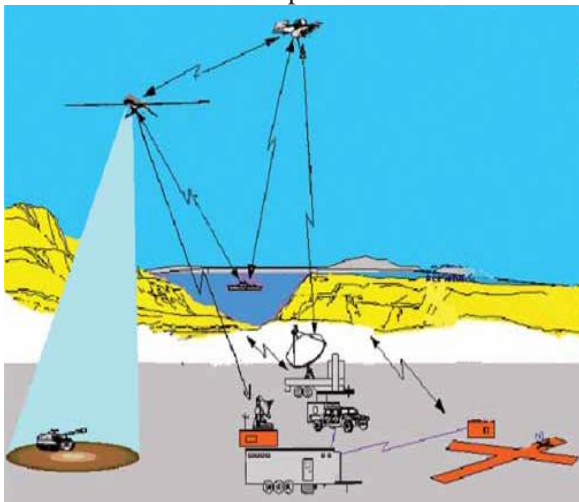
Most UAVS uses Radio frequency front end, that connects the antenna to analog to digital converter and a flight computer which control the avionics. But in UCAVs the telecommunication the transmission system is highly complex and secure as compared to the commercial ones and recreational ones.

The Radio signals from the operator side can be issued from either :

- Ground control - a human operating a radio transmitter/reciever. They can also be controlled by a Smartphone, tablets by using the respective apps.

- Ground Control Station (GCS) - A control base center setup on land or sea that

provides facility for human to control of unmanned vehicle in air or space. Ground control station (GCS) is used to track, control, and monitor the UAV. It also helps in mission planning and validation, payload information exploitation and system diagnostics. The GCS receives telemetry data and generates the parameters display and trajectory display. The parameter display provides the status of sub-systems and attitude of the aircraft. The trajectory display provides the flight path of the aircraft on a geographical map of the area, where the mission takes place.



- Another Manned aircraft or UAV, serving as a mobile control station Military manned-unmanned teaming (MUM-T).

#### How Drones Work

A typical unmanned aircraft is made of light composite materials such as Carbon fibre to reduce weight and increase manoeuvrability. Drones are equipped with different state of the art technology such as infra-red cameras (military UAV), GPS and laser (military UAV). Drones can be controlled by remote control system or a ground cockpit. An unmanned aerial vehicle system has two parts, the drone itself and the control system. The nose of the unmanned aerial vehicle is where all the sensors and navigational systems are present. The rest of the body is complete innovation since there is no loss for space to accommodate humans and also light weight. The engineering materials used to

build the drone are highly complex composites which can absorb vibration which decreases the noise produced.

#### Market Trends

##### UCAVS

The UCAV or Military UAVs market is currently dominated by United states as earlier. The United states was holding around 60% of the market share in 2006 but is expected that it will be projected upto 70% by 2016. US have operated upto 9000+ UAVs in 2014. Israel has been standing as the biggest exporter of the military drone s in the past fifteen years but china has committed a great effort and its manufacturers believe to become the leading producer of UAVs by 2023.

##### Small UAVS

Reports forecasts the small unmanned-aircraft-system market to reach \$8bn in 2019, including services and applications: the professional and hobbyist share representing \$1.1bn and the commercial share \$5.2bn. The estimated leading civil-UAV companies are currently the Chinese DJI with \$500m global sales, the French Parrot with \$110m, and the US 3DRobotics with \$21.6m in 2014.

#### Uses Of UAVs

The UAV have a very vast area of usage. they can be used for multiple purpose from military to commercial to recreational use.

##### • Military Use

1. Reconnaissance : In military operations , reconnaissance is the exploration outside an area occupied by friendly forces to gain info about the enemy presence or the natural features which results in better planning of the mission.

2. Armed attacks : The advantage of using an unmanned vehicle rather than a manned aircraft in such cases is to avoid a diplomatic embarrassment should the aircraft be shot down and the pilots captured, since the bombings take place in countries deemed unfriendly and without the official permission of those countries .

3. Targets for military training : The UAVs can act as a cheap alternative for target practice during the military training. The United States is converting its old airplanes into drones and using them as target to practice in actual environment without risking the lives of its pilots.

#### • Civil Use

##### 1. Hobby and Recreational use :

UAVs are being used by the civilians from the very beginning of their manufacture. Some people fly them as a hobby or for recreational purpose. IN US small racing tournaments are organised where people participate and try to take over each others plane.

##### 2. Teaching purpose :

UAVs are used for teaching purpose to teach students about the aerodynamics and mechanism of an airplane.

RC planes are generally used. This generates the interest in the students.

#### • Commercial use :

##### 1. Commercial aerial surveillance :

Aerial surveillance of large areas is made possible with low-cost UAV systems. Surveillance applications include livestock monitoring, wildfire mapping, pipeline security, home security, road patrol, and antipiracy.

##### 2. Commercial and motion picture filmmaking :

UAVs are now commonly used in the film industry. They are used to add different viewing angles to shot he scene so that it can become more dramatic.

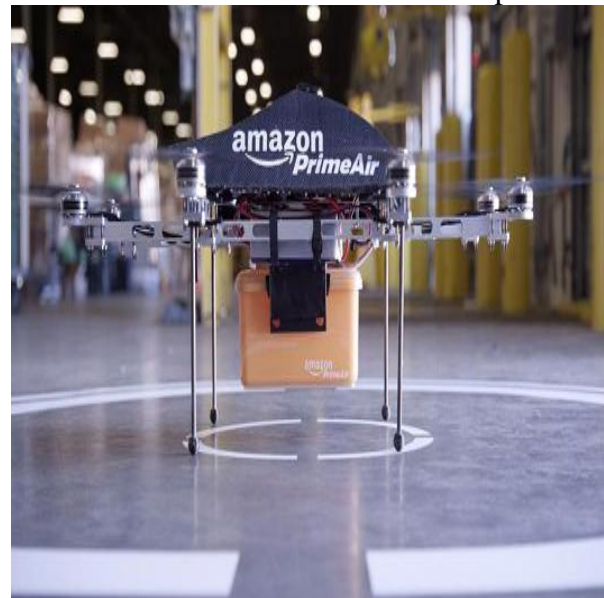
#### • Search and rescue

UAVs were used in search and rescue after hurricanes struck Louisiana and Texas in 2008. Predators, operating between 18,000 and 29,000 feet above sea level, performed search and rescue and damage assessment. UAVs have been tested as airborne lifeguards, locating distressed swimmers using thermal cameras and dropping life preservers to swimmers.

#### *Cargo transport*

UAVs can transport medicines and medical samples into and out of remote or otherwise inaccessible regions.

A 2013 announcement that Amazon was planning deliveries using UAVs was met with skepticism.



In 2013, in a research project of DHL, a small quantity of medicine was delivered via

a

UAV.



In 2014, the prime minister of the UAE announced that the UAE planned to launch a fleet of UAVs to deliver official documents and supply emergency services at accidents.

### Future Scope

In future UAVs can be used to provide medicine or first aid during emergency or in accident area. They can be used by the law enforcements to control the mob by equipping the drone with the pepper spray, smoke bombs or rubber bullets as it is a much safer thing to use a bot than sending a man in the mob. UAVs can be used to look for a person in the jungle during night by thermal imaging. In coming years many food chains can use automated UAVs to deliver their food. Dominos a Famous pizza franchise is experimenting this already. It is possible we would be getting our pizza delivered by a UAVs.



### Future of Commercial UAVs

- Goods Delivery
- First Aid/Disaster relief
- Sports/War Photography
- Atmospheric research
- Wildlife Research



### Legal, Ethical, and Security

With this increasing presence and usage of drones, a major concern is developing. Many people consider this advancement in technology as quite controversial. Many people believe that with drone technology in the government's hand, we will begin to lose our privacy. With no restrictions on drones, governments have the power to monitor its citizens invading precious privacy. Without any restrictions on drone technology, it can be expected that you will no longer have any privacy. Unfortunately most companies are held back from fully implementing their use of drones by regulations. Or rather the lack of regulations. As with many new technologies, most countries don't have clear regulations controlling the use of drones. And there are many valid concerns around the use of drones, including:

- Privacy concerns

The uses of UAV tech raises a broad range of issues that relate to a collection, retention, use, disclosure, and safe destruction of personal information. UAVS presents a unique privacy challenge, due to the manner in which they collect information.

- Drones being used as weapons

Since drones are capable of carrying a certain amount of weight. This feature can be misused by the terrorists who can attach explosives items to it and detonate them once it reaches its desired place.

- Risk to regular aircraft.

The last point is a particularly important concern with an increase in reported near-collisions involving commercial aircraft and drones seen at airports around the world. Although drones are relatively small, striking another plane's propeller (or being sucked into a jet engine) could trigger a larger accident.