

UNMANNED AERIAL VEHICLE IN DEFENCE AND CIVIL SECTOR

Raghav Arora*, Air Cmde Devender Sharma#

* Student, Aeronautical Engineering, Manav Rachna International Institute of Research and Studies, Faridabad

Head of Department, Aeronautical Engineering, Manav Rachna International Institute of Research and Studies

*Corresponding author.

Abstract

An unmanned aerial vehicle(UAV) is an aircraft without a human pilot on board. The technology is emerging from the conventional aircrafts to UAVs and UAS (unmanned aircraft systems). The aim of this paper is to examine the classification, UAV deployment, market structure, drones' laws, and about the unmanned aerial vehicles in the defence and civil sector.

The new developing UAV technologies focuses on the development of the intelligent capabilities and ability of human operator interaction with robotics platform. Such technologies provide a wide range of opportunities to serve better, in return are proven to be a better replacement for human soldiers in the war zones conditions that are unfavourable for them.

Introduction

Drones or unmanned aerial vehicles has been a hot topic as a developing technology. It was in 2018, when UAVswere used in commercial flying legally.In commercial market, drones are significantly used by companies.[1]They are proved useful in disinfecting the areas, delivering essentials. Drones collecting imagery data opens the new doors to data analysis for the companies. These imageries are sophisticated 3-dimension cityscapes that facilitates the local government to prepare “smart city” strategies.

In defence, Aeronautical Development Establishment (ADE), a subsidiary of the Defence Research and Development Organization (DRDO), for the Indian Armed Forces, has developed military drones namely Lakshya and Nishant. Lakshya is a remotely piloted aerial vehicle , development of Lakshya pilotless target aircraft (PTA) was proposed in 1976.The Indian government approved \$3.8m to ADE in September 1980 to design and manufacture the Lakshya[2]. The Nishant UAV is primarily tasked with intelligence gathering over enemy territory and for reconnaissance, training, surveillance, target designation, artillery fire correction, damage assessment, ELINT and SIGINT.[3]

The U.S. military has been flying modern beyond visual line of sight (BVLOS) drones.[4] These drones Fly at a distance outside the normal visible range of the pilots.BVLOS are cost effective and efficient.They require less human intervention and there are fewer take-off and landing phases, so the UAV cover more land in a single mission. In such UAVs there is a higher risk of collisions with other aircrafts damaging the property and people.

Classification

Unmanned Aerial Vehicles (UAVs) form a critical layer in the integrated defence system that the three defence services are now implementing in coordination with one another. Though UAVs have been in service with the three defence services in small numbers since the late 1990s, their mass scale adoption and integration with existing and projected fighting systems has begun in earnest only in the last couple of years.[5]

UAVs can be classified on different grounds.

Based on Landing, Drones are divided into two categories that is HTOL(Horizontal Take-Off and Landing)such drones can fly long distances and VTOL (Vertical Take-Off and Landing) such drones can fly faster. These two ways are also the primary ways of producing lift.

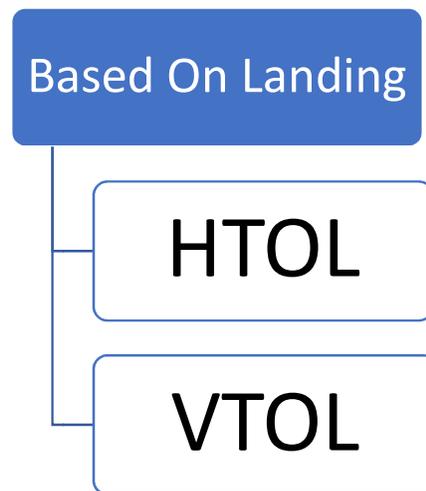


Fig 1: UAVs classified based on landing.

Based on Aerodynamics, Drones are divided into four major categories that is fixed wings, flapped wings, ducted fan and mutli-rotor.



Fig 2: UAVs classified based on aerodynamics.

Based on Size, Drones are classified into following groups. Where large sized drones are easy to build and provide enough power to lift the equipment whereas small sized drones are easily deployable and are efficient.

Types of Drones	Maximum Range (in Km)	Maximum Weight (in Kg)
Nano	5 km	0.2 kg
Micro	25 km	2 kg
Mini	40 km	20 kg
Light	70 km	50 kg
Small	150 km	150 kg
Tactical	150 km	600 kg
MALE	200 km	1000 kg
HALE	250 km	1000 kg
Heavy	1000 km	2000 kg
Super Heavy	1500 km	2500 kg

Fig 3: UAVs classified based on size.[6]

UAV Deployment

Unmanned Aerial Vehicles are critically integrated in the defence sector. Though a small number of UAVs are deployed in the military sector however the large-scale adaption and integration with existing and projecting fighting systems has begun in the earnest only in the last couple of years.[7]

Deployment of Unmanned Aerial Vehicles (UAVs) as an aerial base station is a feasible solution in times of disaster or in case of emergency. Drones operate in a medium that allows easy penetration of a broad variety of sensing and transmission techniques also offers an easy movement in three dimensions.

In civil sector, there are few segments that are very prone to drone usage namely agriculture (helping farmers in watering, sowing)[8], disaster management (drones can be used to spot stranded people and additionally can collect data of the impacted area), surveillance is another significant area which using a lot of drones for monitoring.[9]

In military, UAVs increases the possibility of more efficient and less risky conduct of military operations. The building of unmanned aerial vehicles is no new by any norms. However, for most of the twentieth century, countries have found out the feasibility of developing unmanned aerial vehicles and their ability in military operations. In the situation of chemical warfare or biological warfare are posing increasing risks for manned aircrafts, these UAVs facilitates and suppressing the count of casualties.[10]

A major reason for introducing UAVs in the military was to reduce the risk to human soldiers in combat situations, also to execute the military mission more competently. With the technological advancements in flight controls and data process in gun manned aerial vehicles are emerging as a good replacement for human soldiers that are controlled by trained pilots remotely.

Market Structure

UAV is a highly expanding market providing service in civil as well as military sector. Earlier, only government organizations such as DRDO were the major authority involved in developing UAVs.[11] Recently, in conjunction with government projects, the private sector has developed a great interest in design, development, and manufacturing of UAVs. Thus, we can say that the India UAV market is still in its early stages of lifecycle with robust growing prospects.

Likewise, in the other parts of the world market of drones is rising with a huge amount of investment in it. Not only for military usage these flying machines are also used in civil sector. Companies are interested in investing in this market.[12]

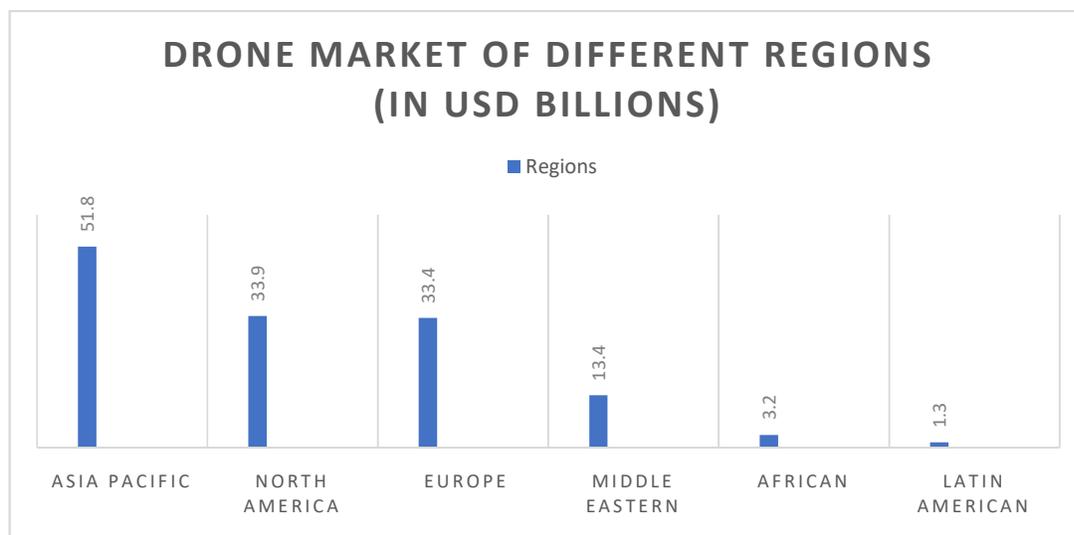


Fig 4: The above graph shows the regions and their expenditure in drone market in USD billions.

By 2024, U.S. will be leading the UAV market with the compound annual growth rate (CAGR) of USD 897.25 million.

Drone Laws

Corresponding to Indian National Aviation Authorization, flying drones is legal in India, under the guidelines listed by the Ministry of Civil Aviation. The first Civil Aviation Requirement (CAR) was announced on Aug27, 2018 to be put into effect from Dec1, 2018, by Directorate General of Civil Aviation. A new set of rules are released for 2021, for safe and sensible flying.[13] Subsequent are the flying constraints:

- No micro drones shall fly beyond a height of 60 m above ground level or a maximum speed of 25 m/s.
- No small drones shall fly beyond a height of 120 m above ground level or a maximum speed of 25 m/s.
- No medium or large drones shall fly in accordance with the condition specified in the operator permit issued by DGCA.

Special Travel Concerns

Foreigners are presently not permitted to fly drones in India. For commercial purposes, they need to lease the drone to an Indian entity who in-turn will obtain Unique Identification Number (UIN) and UAOP from DGCA.[14]

The Central Government can exempt any ministry, department, or a government affiliated agency at both central or state level from the requirements of a drone operator permit if it is national interest or helps to upload the security of the country.

No Permission, No Take Off

India has developed a “No Permission, No Take Off” (NPNT) policy according to which each time a pilot wishes to fly a drone, he/she must seek permission before the flight. Deprived of the approval of Digital Sky Platform, he or she will simply not be able to take-off.

No Fly Zone

In India, there are some specified areas and the distances that are restricted for drone flying. Also, Federal Aviation Administration (FAA) is leading a campaign for no-fly zones. This is to promote safety and responsible use of unmanned aerial vehicles.[15]

Conclusion

There is a necessity for drones with distinct capabilities in both civil as well as military applications. This emerging technology has been proven more efficient and effective in the situations that are unfavourable for humans to work, hence reducing the number of casualties. To deal with different scenarios there is a wide range of drones with their unique abilities.

Unmanned Aerial Vehicles (UAVs) or drones is a new emerging market with large amount of financial investment. Drones performs computerized controlled commands. Accounting for more than 70% of the global drone market, the government segment, comprising of military and law enforcement agencies, was the key demand generator for drones. Primarily used to conduct intelligence, surveillance and reconnaissance (ISR) activities, military UAVs are currently being developed for a wide range of uses such as electronic attack (EA), strike missions, suppression/destruction of enemy air defences (SEAD), network nodes, communication relays, and combat search and rescue (CSAR).

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