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Drones and Future Feasibility of Drones in India

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ABSTRACT

“Everything that can be invented has been invented.”

This statement came into light when it was appealed to the US Patent Office Commissioner, Charles H. Duell in 1899. However, it was proved wrong with the advancement in technology. An example of this is the invention of drones which has proved beneficial for mankind. Drones are unmanned aircraft which is controlled by a pilot who is not on board but is able to control the working of the drone from one place. Drones’ have been used for many purposes which has been explained in the paper. The research paper highlights the evolution of drones and the various types of drones used in different sectors. Initially drones were used for the purpose of security however, with the availability of advanced technology drones have been adjusted as per the purpose for which it is employed. The research paper gives an overview of drones and suggests ways in which drones can be made easily accessible for various purposes without getting into many complications.

Keywords: *Drones, Unmanned Aircraft, Future Feasibility.*

I. INTRODUCTION

According to C4I expert Milind Kulshrestha, “With their unprecedented reconnaissance capabilities and the ability to trace a target for hours, the drone is the favourite word with all militaries. For the future of the Indian Military, the Unmanned Combat Aerial Vehicles (UCAVs) are important as they are capable of stealthily penetrating the enemy air space with an explosive payload and missiles.”² Drones have proved to be advantageous to many due to the diverse factors it entails. Drones depending on the purpose for which it is employed can serve the purpose and with minimal loss or harm to human life. Due to these benefits drones have gained popularity among many in India and across the world. Initially, drones were solely used for security however it has broadened the horizon of opportunities for different sectors.

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² Drones to be the future of warfare? India needs more code writers, data analysts, , THE FINANCIAL EXPRESS (2020), <https://www.financialexpress.com/defence/drones-to-be-the-future-of-warfare-india-needs-more-code-writers-data-analysts/2105166/> (last visited Nov 21, 2020).

Depending on the accessories the drone can carry, an aerial view, knowledge of the weather, extent of harm can all be seen and sensed using the sensors on the drone. Along with the advantages the drones have certain disadvantages too due to which it has not been given the green signal as yet. The research paper aims at analysing the advantages as well as the disadvantages of drones and suggests ways it can be feasible for the future.

(A) Importance of the study

The research paper aims at highlighting the importance of drones and the potential use of drones in the future. It is important to understand that drones could potentially change the way in which different sectors would function in the future. The use of drones can make many tasks simpler and more convenient for people with minimal human efforts. It can be used in dangerous situations to get an aerial view of the extent of harm that has been cause. The paper focuses on the positive as well as negative impacts that drones may have and suggests ways in which drones can be more feasible to use for our benefit. It is also important to acknowledge that drones open up a plethora of opportunities for many with the advanced level of technology involved the processing of data that is required after gathering information from the drone. The advanced level of technology will lead to a healthy competitive attitude which would further improve the quality of drones and make them for advantageous.

(B) Scope of the study

The research paper focuses on drones and the ways in which it can be used in India. It also suggests ways in which the difficulties faced can be solved along with improving the quality of the already existing drones. The paper also highlights certain ambiguities between the actual working and the rules and guidelines. The research paper restricts to drones being used in India only in sectors such as the agricultural sector, commercial sector, for the purpose of security, surveillance, beach rescue missions, fire-fighting, weather tracking and many other.

(C) Research problem

1. What are the legalities for the use of drone in India?
2. What is the scope of the usage of drones with the current increasing technology?
3. How do the different sectors benefit from the use of drones?
4. Will the use of drones prove beneficial with the given standards of rules and regulations?

(D) Objectives

- To study the benefits and drawbacks of drones
- To understand the working of drones and its usage in India.

- To explore the problems arising due to the use of drones.
- To understand the future scope of drones in India.
- To analyse the working of drones and effectiveness of its usage.

(E) Hypothesis

Null Hypothesis (H_0): There is no significant benefit from the usage of drones for the future in India.

Alternative Hypothesis (H_1): There is a significant benefit from the usage of drones for the future in India.

(F) Research methodology

The research paper follows a doctrinal method of research to understand the working and use of drones in India as well as its future scope. The research paper consists of data from secondary sources such as research papers, articles, journals. The purpose of choosing this particular topic was to understand what is the scope of drones and can it be a potential option in the future for various industries. The research paper also consists of suggestion to improve the use of drones and increase its credibility in the future.

(G) Review of literature

- **Anirban Mukherjee et al. (2017):** in their research paper titled “How is DRONE Going to Impact Indian Agriculture?” have explained how the agricultural sector can benefit with the use of drones. Drones can help in resource mapping, reaching the areas which cannot be reached easily, getting a real-time image, and monitoring according to convenience. Along with the advantages there are a number of technological as well as administrative issues that need to be addressed before employing drones. Although the technology which allows the access to drones has brought in a breakthrough for India its applications can pose many challenges.

- **Breanne Schneider (2018):** “India’s Drones: Assessing the Rationale for Unmanned Aerial Vehicle Acquisition” highlighted how drones have been used as strategic weapons by the army as it avoids risking the life of soldiers and carries out the assigned task. The paper explains that since India shares borders with countries like Pakistan and China, it has had a potential interest in the use of drones to avoid terrorist activities and increase security. The research paper gives an overview of how India has accepted drones and for what reasons.

- **Gaurav Singhal et al. (2018):** in the research paper titled “Unmanned Aerial Vehicle classification, Applications and challenges: A Review” have explained about the various aspects involved in the configuration of drones. Along with the hardware body of the device it

includes the take-off and landing of the drone, a design which is suitable for the task required to accomplish, grounding linking systems, accessories such as cameras, sensors, film imaging units which have to be under 12lbs as a drone cannot carry heavy accessories. The paper further explains how drones can be useful to protect wildlife since animals can camouflage themselves around the environment, this reduces the risk of animal attacks on humans. Along with various industries, defence and environmental concerns drones have the ability to report civil applications as well.

- **Mohan Ramesh Mudaliar and Sumit Ganesh Sorate (2018):** in their research paper “New Era of Drones in India and its Future” have highlighted how drones carry along with them a plethora of advantages in more ways than one. It can be used in agriculture, delivery of essential where there are time constraints, fire-fighting, fishing in the deep sea or rough places which can otherwise be harmful for humans, environment monitoring, beach rescue, media, security and many potential areas. The key feature of drones is that it reduces the risk to human life as it can reach places which would otherwise be dangerous for humans and it can cover larger ground in less time. While the technology of drones is time saving it is not cost saving and requires a large amount of investment with advanced technology.

- **Nishith Desai Associates (2018):** in the paper “Unravelling the Future Game of Drones: Can they be legitimized?” have given a brief overview of drones. The paper also lays down the different aspects of various countries along with India and what is the current scenario in India including the road ahead. It highlights that the rules and regulations of drones should be based on the use of the drone since it can cater to the requirements for which it has been employed. The successful use of drones would depend on the achievement of a synergistic integration of law, tax and civil liberties.

- **R. K. Narang (2018):** in his research paper titled “India’s Drone Regulations-1.0: Progress, Policy Gaps and Future Trajectory” explains that while examining the advantages of drones, India at the time did not possess that kind of technology or infrastructure and regulatory mechanism to allow the use of Remotely-piloted Aircraft System (RPAS) with the desired level of safety. The research paper also mentions a task force which was set up to research about the future aspects of drones and their feasibility. It was mentioned that India was not ready with that level of preparedness and expertise to control air traffic system and many other characteristics. Due to the lack of various agencies that are involved in the development of drones has faced difficulties.

- **Rajeshwari Pillai Rajagopalan and Rahul Krishna (2018):** in the paper “Drones: Guidelines, Regulations, and Policy gaps in India” explains the gaps in the policy given by the

DGCA (Directorate General of Civil Aviation) regarding the guidelines for the use of drones. Since major of drones are being imported the quality of drones imported from different places is not uniform and hence can pose as an issue. These quality issues can lead to legal issues depending who will be liable in case of a mishap. Along with quality threat, drones also raise privacy concerns and terrorist threat. Since drones are not as easy to track compared to commercial aircrafts, the problem of air traffic is a rising challenge leading to many dangerous possibilities. On analysing the guidelines laid down by other countries, the paper underlines that only guidelines are not sufficient but the implementation and compliance of these guidelines is significant.

- **Srijan Pal Singh (2019):** an article titled “Drones in India: Weighed down by regulation, sector struggles to find wings” published in *The Economic Times* explains how the concept of drones evolved over time which is dated back to the 1849 based on an event which occurred in Venice. It was in 1849 when for the very first time the concept of unmanned flying objects was introduced. The article further explains the complications that are laid down by the Digital Sky Platform to comply with various rules and regulations to fly a drone.

- **Aastha Khurana (2020):** Though technology has its positive ways it can at the same time be disruptive too. The article “Regulation of Drones in India” elaborates on how the global market for drones have grown and so have the debates regarding the same. Although India does not have a clear mechanism to oversee the use of drones many issues have come to light as drones gained popularity. The use of drone will be a tool for development in India with the increase in the level of technology and has the potential to protect the security of the country. Given that India has no standard protocol for drones there have many incidents that raise alarming issues. The article highlights that in 2015, a drone was seen flying close to the Rashtrapti Bhavan and the Indian Parliament. The police being confused did not know how to deal with the situation which proved ineffective.

- **Dr. Santanu Bhattacharya (2020):** in the article “The Next Big Thing Post COVID-19! Creating a Drone Economy in India” states the key highlights with respect to drones in India. All drones under 250gm need to be registered with a Unique Identification Number (UIN) and the Civil Aviation Requirements (CAR) regulate the UAVs. Drone pilot must maintain a visual line of sight and cannot fly above 400 feet. The article also reveals that due to the increase in the drone market, it will create enormous amount of job opportunities for drone pilots in India. It is important to step back and view how the next 10 years in the air would look like for India before making a strategic investment.

- **Huma Siddiqui (2020):** in the article titled “Drones to be the future of warfare? India needs more code writers; data analysts” highlights the capability of drones and how India can benefit from drones. According to a report by the Financial Express Online, Drones or the UAV (Unmanned Aerial Vehicles) have the ability to replace 80% of the operation which is currently carried out by manned aircrafts. While India shores territories with Pakistan and China, drones can prove to be beneficial to the Army as well as the Air Force. The article also highlights the key feature regarding the involvement of AI in the use of drone which is a very important mechanism. While drones have the advantages, the use of drone during war or to protect the border of one’s country can prove to be fatal since the technology can be hacked by the enemy and the drones could then strike based on the changed algorithm.

- **Kanika Dhamija (2020):** explains in the article “Flying High: The Future of Drone Technology in Indian Agriculture” that the adoption of technology in agriculture opens a new window of advantages for farmers who are in a vulnerable state due to the changing weather conditions which can otherwise cause loss to them. Use of drones in agriculture industry can increase the irrigation approach and soil health also alerting the farmers about the health of the crop and what needs to be the next step. Rapid evolving software and intense continuous research has contributed to the widening of future possibilities for use of drones in India.

- **Kunal Kislay (2020):** in the article “Drones in India, Are We Ready for the Take-off?” explains the evolution of drones and the evolution of drone policy in India. India seems to have missed out on a lot due to the delay in giving drones the green signals. However, drones do have their own disadvantages that cannot be ignored as they are topics of concern. Drones have multiple use in various sectors of India and that is the reason it has gained so much popularity. The use of drones helped to combat the Covid-19 pandemic in India which proved to be very beneficial for the country. Currently with the ‘No Permit No Take-off’ (NPNT) clause it enables drone pilots to operate on around 70% of Indian landscape which is marked as green and yellow zones.

- **Strategic Investment Research Unit (SIRU) (2020):** “The growing market for drone technologies in India” titled article mentions the future potential of drone market in India. The article explains how drones are already used by the government and by those that can afford them for blogs, vlogs, create documentaries and for personal use. Coal India used drones to track illegal mining and hence can prove beneficial if used correctly. Technology itself gets advanced and new opportunities arise every now and then. With large companies such as Amazon exploring the option of drones it can prove beneficial economically to the Indian market given its popularity and ease of operation.

II. ANALYSIS OF DATA

Unmanned Aerial Vehicles (UAVs), or drones, are a modern technological innovation that provide a state with the capability to accurately strike a target without directly risking the lives of its own military personnel.³

Drones are unmanned aircraft controlled by remote controller and it does not require special training to aviate them in air.⁴ Drones can be available in many types, cost with various features and accessories depending on the purpose for which it is used. Drones uses smart computing devices for data capturing with the help of wireless technologies.⁵

Unmanned Aircraft (UA) are the future of aviation, and global aviation leaders have been developing enabling technologies and experimenting with regulatory options to facilitate integration of unmanned-manned aircraft operations.⁶

UAV's is the best example to view how technology has changed over the years. From aircrafts with pilots to aircraft without the requirement of a pilot on-board, these machines have gained a lot of importance due to their advantages and progress in technology.

An Unmanned Aerial Vehicle also called a drone is an aircraft that is flown without a pilot. The term drone has been used since 1920s, for the target aircrafts. It is a commonly used word by the public. The term Unmanned Aerial vehicle was adopted by the International Civil Aviation Organisation. The Remotely Piloted Aircraft Systems Panel [RPASP] was developed by the ICAO. This includes guidelines and procedure for the safe and secure flight of the remotely piloted aircrafts.

Drones, as we know them today, represents a significant development in robotic technology⁷ and the use of drones in commercial activities have opened new windows of opportunities for many in India. Due to their popularity drones have received a lot of attention from various aspects. The use of drones is in many ways which is the biggest advantage that it possesses. In common terminology, drones refer to aerial vehicles, which can fly without a human operator.⁸

³ Breanne Schneider (2018) " INDIA'S DRONES: ASSESSING THE RATIONALE FOR UNMANNED AERIAL VEHICLE ACQUISITION" Volume XII.

⁴ Mohan Ramesh Mudaliar, Sumit Ganesh Sorate (2018) "New Era of Drones in India and its Future", International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 06.

⁵ Id.

⁶ R. K. Narang (2018) "INDIA'S DRONE REGULATIONS-1.0: PROGRESS, POLICY GAPS AND FUTURE TRAJECTORY", AIR POWER Journal Vol. 13 No. 4.

⁷ PAUL HOLDEN, *Flying Robots and Privacy in Canada* (2016), <https://papers.ssrn.com/abstract=2571490> (last visited Nov 27, 2020).

⁸Unravelling_The_Future_Game_of_Drones.pdf, http://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research%20Papers/Unravelling_The_Future_Game_of_Drones.pdf.

Drones can be defined as power driven aircrafts which work on remote human control and can be reach places that may be harmful for humans. Drones do not need a human operator on board and can be controlled from a single area.

Drones can vary from shape, size, use of technology, depending on the purpose of drones, shape, required accessories and other aspects as well. A drone can vary from using it by the army for reasons of security, to using it for commercial reasons like delivery of items or a toy drone made for kids.

(A) Categories of Drones

Except for Nano all other categories of drones require to be registered.

- Nano: Less than or equal to 250 grams
- Micro: From 250 grams to 2kg
- Small: From 2kg to 25kg
- Medium: From 25kg to 150kg
- Large: Greater than 150kg

(B) Attachments

- Global Navigation System
- Control system for operating the drone
- A camera
- Lights to go off during collision time or lights for indication
- A plate with the Unique Identification Number

Micro size drones flying up to 400 ft. in controlled airspace shall also have the following attachments.

- A radar system that specifies the position and altitude of the aircraft for avoiding traffic.
- Geo fencing capability
- Ability to detect and avoid

(C) Zones for Flying a Drone

- Drones cannot be operated within 5 km of airports at Mumbai, Delhi, Bengaluru, Chennai, Kolkata, Hyderabad. The boundary for airports in other cities as well defence airports is 3km.
- Drones cannot be flown within 3 km of areas which have military installations.

- Ministry of Environment, Forest and Climate Change needs to provide special permission if drones are to be operated near any wildlife sanctuaries or sensitive wildlife areas.
- Drones are not allowed to be flown near the borders as a matter of national security.

(D) Zone Required Equipment in India

- GPS
- Return-to-home (RTH)
- Anti-collision light
- ID plate
- Flight data logging capability with a flight controller
- RF ID and SIM/No Permission No Take-off (NPNT)⁹

Before a flight, the pilot is required to send in a request through a mobile app. On the basis of which the pilot will be allowed to fly. India has a system called “No Permission, No Takeoff” (NPNT). If a drone pilot tries to fly without receiving permission from the Digital Sky Platform, he or she will simply not be able to take off.¹⁰

According to the guidelines of the DGCA, drone operators will need to obtain a Unique Identification Number (UIN) for their UAV and security clearance from the Ministry of Home Affairs (MHA) before they can get their drone in the air.¹¹ The operator is required to submit a set of documents on the basis of which the UIN will be granted. The UIN needs to be physically present on the drone at the time of flying. The UIN will be assigned subject to security clearance; however, it is not specified what the basis of this clearance will be, as the circular simply mentions that it will be dealt with on a “case-to-case basis”.¹²

(E) Application of Drones

1. Agricultural use: Drones can be used in many ways and this feature of drones is what has helped gain drones popularity and attention from different sectors. Drones can be used by the agricultural sector for the purpose of spraying pesticides, farming area management, checking the soil variation and the weather. Since drones can cover a large portion of land in

⁹ Drone Laws in India | UAV Coach (2020), , UAV COACH , <https://uavcoach.com/drone-laws-in-india>.

¹⁰ *Id.*

¹¹ Rajeswari Pillai Rajagopalan and Rahul Krishna and Rahul Krishna, *Drones: Guidelines, regulations, and policy gaps in India*, ORF , <https://www.orfonline.org/research/drones-guidelines-regulations-and-policy-gaps-in-india>.

¹² *Id.*

less time it is very convenient for farmers. Drones can be used at any time which adds to the many benefits and can reduce the labour of farmers to the very minimal.

2. Drone delivery: With the growing competition in the market, companies are trying their best to serve their customers in the most efficient and attractive ways. Companies do not hesitate to try new technology and idea since it draws attention of the general public. Drones have fulfilled this purpose in the commercial sector where companies are aiming at delivering products through drones as this save time, labour money and plays as an attractive publicity tool for the companies. The shopping giant amazon has already implemented delivery by drone service named ‘Amazon Prime air’ in the United States.¹³ A couple from New Zealand has become the first people in the world to have a pizza delivered by drone, Domino’s claims world’s 1st drone pizza delivery in 16 Nov 2016 within 5 minutes.¹⁴

3. Firefighting: Drones that are equipped to navigate in challenging environments of solid smoke are able to locate people and exits using advances sensors, which could make a significant difference in such life and death situations.¹⁵ These types of drones help the personnel gauge the seriousness of the situation and prepare for the further course of action. Since drones can enter through dangerous and harmful areas it proves to be a lifesaver for humans at times of risk. The drones move help understand the extent of the fire by capturing an aerial view and help search missing persons with the help of sensors and cameras. Drones can carry fire extinguisher balls and can drop it in fire zone where firefighter can’t reach.¹⁶

4. Media/ News: Drones are used widely for many purposes one of which is media. In order to showcase to their viewers, the ground reality, many news channels and journalist use drones to capture images of incidents that have taken place. The aerial view of the area given a better understanding of the seriousness of the incident that has taken place. Drones are also used for the purpose of film making. Many a times, directors want an aerial view of the area or a 360-degree picture of the area, this is why drones have gained popularity for many reasons. Filming shots that require adrenalin-filled action sequences¹⁷ are helpful with the use of drones.

5. Beach Rescue and Fishing: In deep waters where it can be risky for humans to reach, drones give a view of the situation. Accessories which can be used for a given purpose can be

¹³ Amazon Reveals New Details About Drone Deliveries, , TIME , <https://time.com/4185117/amazon-prime-air-drone-delivery>.

¹⁴ CNBC article by David Reid, November 16,2016. [8] BUSINESS STANDARD article by Gireesh Babu, October 9, 2017.

¹⁵ Fire Fighting Drones, , AZOROBOTICS.COM (2017), <https://www.azorobotics.com/Article.aspx?ArticleID=219>.

¹⁶ Supra No. 5.

¹⁷ Supra No. 5.

attached to the drone. However, for the use of drones in the sea the weather or condition needs to be feasible for the working of drones. Areas with deep water, rocky places and areas with dangerous or harmful fish can be reached without risking human life with the help of drones. Drones can also be deployed at beaches to keep a check on the tide and ensure that the people do not go into deep water. It helps to spot easily from the sky and larger ground can be covered in lesser time. In beaches at Florida, many times sharks or orcas (killer whales) tend to come up to the shore in search of food. This is why drones are used to go further ahead and ensure that the coast is clear and no one is in danger. Lifeguard drone will carry the lifebuoy ring and reach the place where the help is needed, it will be controlled remotely to reach the location and drop the lifebuoy ring over the drowning person who needs help.¹⁸

6. Environmental Monitoring: Over the last decade, lightweight unmanned aerial systems (UAS) have evolved to become an integral element of spatially distributed environmental monitoring.¹⁹ Drones have more recently begun to be used for environment monitoring including but not limited to collecting the data regarding plant and algae growth, invasive species, habitats, climate change, eco-system, crop assessment and urbanization.²⁰ Information gathered from the disaster management department can be cross checked with the help of drones. Many wildlife helpers use drones to spot wounded animals who are in need of assistance.

III. FINDINGS

- With regards to drones, the greatest question that arises is the technological aspect. Drones need advanced level of technology with minimal complications and easy to use facility for the drone pilot. Although technology has its positive sides it can be disruptive too. Technology has the possibility of failing anytime or the possibility of being hacked by the enemy. Since drones carry out important or crucial information this can prove to be very disadvantageous to the drone users.

- Due to the breach of privacy, drones have been looked down upon. This exposes the drone to hacking or breach of privacy and thus works as a disadvantage for the drone. The privacy issues need to be addressed on an important basis since it plays a very important role.

¹⁸ G. Xiang et al., *Design of the life-ring drone delivery system for rip current rescue*, in 2016 IEEE SYSTEMS AND INFORMATION ENGINEERING DESIGN SYMPOSIUM (SIEDS) 181–186 (2016).

¹⁹ Helge Aasen et al. (2020) "Current Practices in UAS-based Environmental Monitoring" 12, 1001.

²⁰ Daniele Ventura et al., *Unmanned Aerial Systems (UASs) for Environmental Monitoring: A Review with Applications in Coastal Habitats*, AER. ROBOTS - AERODYN. CONTROL APPL. (2017), <https://www.intechopen.com/books/aerial-robots-aerodynamics-control-and-applications/unmanned-aerial-systems-uass-for-environmental-monitoring-a-review-with-applications-in-coastal-habitats> (last visited Nov 28, 2020).

The use of drones by military carry confidential information which if exposed could prove fatal and potential disruptive.

- Since drones are electrical devices it cannot be used in hard weather since it is a delicate device. It does not guarantee the working of drones in harsh conditions which defeats the purpose of drones. Drones are used in place where human cannot enter or it is potentially dangerous. However, if this is not one of the benefits of drones then the drones have no potential use. Drones are electric devices and hence may run a risk while using in the rainy season. It could destroy the information saved in the drone and this would prove the mission to be a failure.

- The use of drones has to face many technical issues before being easily available for commercial or any other services. The electrical failure of drones could lose all the data collected by the drone or the drone pilot could lose the control of the drone. Hence anyone could get access to crucial information collected by the drone. Since it is an electrical device, it can be hampered with if it falls in the wrong hands. Drones along with electrical issues also run on batteries which can run out of charge and the drone would collapse which could damage the body of the drone. Drones are very delicately made and one crash could do a lot of harm to the drone rendering it useless for further tasks.

- Drones also carry along with it many expensive sensors and heavy accessories which the drone may not be able to hold for too long in the same position. Due to the wind or any other obstacles in the air, the drones could get damaged or any sensor or camera could fall off or be disabled which could prove to be very expensive to repair.

- Drones are imported as well as exported in India. The drones that are imported could be from different places with different configuration. The lack of quality control for both the manufacturers and importers would present several challenges. The liability to ascertain in case of mishaps would be difficult in case of device malfunctioning. Since drones are machines, it would be difficult to determine whether the mishap took place due to malfunctioning of devices or if it was the drone pilot that handled or operated it in a way that proved to be harmful. Due to the absence of standardised guidelines, drones could face many complications in the future.

- Drones collect raw data or perhaps primary data and this data is useful only if it is processed properly. If the data is not processed properly, the data collected by the drone is useless. Drones possess raw data which need to be processed into sophisticated, comprehensive data with the help of heavy computerised systems useful for the purpose. For this very purpose, a trained staff is to be provided. The pilots that need to fly drones have to go under training in order to be certified to use a drone. However, the administration that is behind the entire project

have to be trained and need to possess proper knowledge for the same. Separate departments need to be provided for different mission or in case on any emergency that may occur. A trained administration staff has to be prepared for the successful working of drones which could positively lead to a lot of job opportunities too. This open a new window for many firms and start ups since drones are gaining popularity. Many millennial that are good with computers and technology could use this opportunity to develop easy ways for the working and monitoring of drones.

- Since drones are handled by a pilot who is not physically present at the time on the particular spot, many cases of air traffic or trespass would take place. These aspects would give rise to legal issues. Drones showcase a different dimension regarding the management of air traffic as it is not as easy to track like aircrafts. British Law has a Latin dictum “ad coelum et ad inferos” which means “to the heavens and hell” which helps to describe the extent of private property underground as well as in the sky. However, society had to take cognizance of the fact that there has to be a limit in order to protect the private property of an individual both above and below the ground. The use of drone would invade into this privacy thus breaching the right to privacy of an individual.

- The drones have a very advantageous feature towards the agricultural sector. It is helpful with spraying pesticides, observing the crop conditions and the weather that may come towards the direction. It is also safer and more convenient as it can cover a larger area in less time and help allocate resources according to the needs. Drones help in real-time mapping of an area. Since drones have the capacity to move closer to the crops as and when required and can take pictures in different angles. This has proved to be very beneficial to the farming sector and farmers are benefitting from the same.

- Drones are machines which can be used at the time of war since it does not cost human life. These machines can be used for the purpose of surveillance and ensuring security of borders and it can be compact and can be camouflaged easily. Many a times drones have been used by the army to carry out strike to keep in tract of the enemy and their movements. These help the army to plan the further course of action and move around in places which cannot be reached easily. However, along with the advantages there are disadvantages too. Since machines can be hacked easily the drones can be hacked by others to access crucial information which may be harmful. Since drones are machines the AI used in them may not be able to discriminate between the army personals and the civilian which will the cost the life of the innocent.

- The use of drones provided helpful in the time of lockdown during the Covid-19 crisis. Many governments used drones to ensure lockdown rules were adhered to and ensure safe distance among people. Since it was risky for people to go out and ensure the lockdown was followed, drones were used which served the purpose.

- Drones also help in spraying sanitizers and disinfectants. The states of Telangana, Tamil Nadu, Karnataka etc. have used drones for the purpose of spraying disinfectant on buildings and streets. A start-up based in Telangana has demonstrated the use of drones for the purpose of delivering medical supplies.

IV. SUGGESTIONS

- For the purpose of compliance, drones are not differentiated in India. However, depending on the use of drones and the purpose for which it is being used whether educational/recreational, the guidelines could be formed accordingly. In most countries, the compliance of rules and regulations depends on the use of the drone and the same must be considered for India.

- Since drones involve technology, it is essential to include foreign as well as Indian players in the market. This will give a diverse understanding of the drones and technology used and would further lead to increase in the level of technology and competition.

- For legal purposes, the terms “operator” and “owner” should be specifically defined. Interchanging these terms would lead to ambiguity and difficulty in determining the liability of the person liable for the act. The current guidelines have used the words interchangeably which creates uncertainty on certain compliance in relation to operation/ ownership of drones.

- Specialised training of staff is essential for the smooth functioning of drones. An analysis depending on the different situations in which a drone can be should be assessed and strategy should be prepared for the same. For example, if a drone enters a different and unknown territory or falls into the hands of another person, facilities should be made to delete the data stored in the drone to avoid accessibility of data to the wrong person. In case of failure of device, trouble shooting the device or providing GPS locating of the drone should be essential.

- A learners or beginners license should be issued to the pilot so that the drone pilots get a better experience of flying drones. This would increase confidence in the pilots and based on this a permanent license can be issued to the pilot.

- Larger UAVs must have an onboard voice and data recording system since these drones are used for important missions. These would prove beneficial for post-accident analysis.

- Private sector players should be motivated and encouraged to enter the race and market of manufacturing drones to have an effective, advanced and innovative equipment with associated technologies. Transparent policy will be a revolutionary measure keeping in mind the drawbacks that can prove to be fatal for humans.

V. CONCLUSION

Over all, drone technology has brought a remarkable breakthrough and new opportunities but its actual application in the field scale still needs to meet many scientific challenges. Due to the many complications that come along with the usage of drones, India has not allowed the use of drones. A proper analysis of the disadvantageous and solutions to these problems would enable the better use of drone in the right sense. Since drones open a plethora of options for many individuals and can broaden the horizon of technology employed by the people with regards to machines. Drones have gained popularity due to the benefits it provides and has is very feasible for the future in lines of real development. Hence, it can be concluded that there is significant benefit from the usage of drones in the future for India.

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