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A Brief Description of Drone Technology

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ABSTRACT: ***This article discusses drones and how they may be used. The drone's construction was first considered, with the frame, propellers, engine, power system, electronic control, and communication system being the most essential components. A drone is powered by batteries, which is a significant disadvantage since the batteries run out after 15 minutes of flying, resulting in a reduced drone on the ground. The drones are propelled by lithium-polymer batteries. The military and commercial drones were then compared on chosen instances. In terms of size and propulsion, military drones vary from civilian drones. They are larger and use internal combustion engines to power them. Electric motors power civilian drones. The potential for utilizing drones were then shown. They may be employed by the government (police, fire departments, border guards), the army, industry, for photographing and filmmaking, and for transporting goods. The article depicts the dangers associated with the use of drones. The biggest risk of operating drones is a drone falling from a considerable height, which may be caused by a discharged battery, weather-related damage (low air temperature, precipitation), or a collision with an object (tree, building, high-voltage line). Many efforts are now underway to create electricity for drones, including grapheme batteries, pure lithium anodes, and fuel cells. One of the most significant dangers connected with the widespread deployment of civilian drones is that of privacy and citizen rights.***

KEYWORDS: ***Civil Drone, Construction, Drones, Lithium-Polymers Accumulators, Military Drones, Risk Assessment.***

1. INTRODUCTION

Drones, also known as Unmanned Aerial Systems (UAV - Unmanned Aerial Vehicle or UAS - Unmanned Aerial Systems), are aircraft that can fly without a pilot or passengers on board. Drones may be controlled remotely through radio waves or independently (with a predetermined route). Drones don't have a particular drive size or kind. They are often fitted with optoelectronic heads, which are utilized for surveillance and monitoring. The drones' most significant characteristic is that they don't need any extra infrastructure to rapidly register and monitor a specified region or item. When it comes to commissioning and prepping the unit for a flight, the very fast response time is a major benefit. Aircraft employed mainly in the uniformed services - the army and police - were the forerunners of UAVs. The United States, the United Kingdom, Russia, Germany, and Israel were among the first nations to conduct UAV research. The Austrians deployed an unmanned flying aircraft for the first time in August of 1849. At the time, explosive-filled balloons, which had been around for over 150 years and could be used as bombs, were utilized[1], [2].

1.1 Drones Construction:

Drones are made up of two main systems: 1. the movement system and 2. the control system.

i. Movement system:

a. Frame:

A drone's fundamental component is its frame, which should be as light as possible. The number of arms used to classify frame structure is the most important factor. Figure 1 depicts the various frame construction options. Drones are classified as follows based on the number of arms and motors used:

There are two engines in bicopters, three engines in tricopters, four engines in quadrocopters, six engines in hexacopters, and eight engines in octocopters.

It is well acknowledged that a design with more arms provides for more stable flying. Carbon cloth 3K is used to construct the frame.

b. Propellers and engine:

The engine and propellers are the next parts of a drone. They are the drone's primary propulsion system and are exposed to the greatest stresses, therefore their durability is critical. The propellers convert a torque (from the engine) into work that lifts the vehicle into the air.

c. *The power of a drone:*

The kind of drive and the type of power source have an impact on the object's residence duration in the air. A drone is powered by batteries, which is a significant disadvantage since the batteries run out after 15 minutes of flying, resulting in a reduced drone on the ground. Batteries, in general, are groups of two or more identical voltaic cells that provide a current that is greater than that of a single cell. Disposable batteries and electric accumulators that can be loaded and emptied many times are two types of these. Complex chemical processes occur in batteries and accumulators, in which various chemical components participate depending on the kind of battery. The chemical energy contained in their active ingredients is transformed into electrical energy as a consequence of chemical processes. Chemical current sources are what batteries are. Chemical current sources work on the basis of a collection of active chemicals and an electrolyte. In the batteries and accumulators, this set works as a cell with positive and negative electrodes and an electrolyte in separate sealed enclosures[3]–[6].

d. Civil drones:

The DJI Phantom Vision 2 (shown in Figure 1) is an example of a drone that may be used for photography and videography. The aircraft battery weighs 1160 grams. The four rotors are powered by a lithium-polymer battery with a capacity of 5200 mAh, which allows for 25 minutes of continuous flying while recording. Using the remote control, the control is carried out via air waves at a frequency of 5.8 GHz. The effective control range is 300 meters, and with signal amplifiers, it may be increased to 1000 meters. The Wi-Fi module allows the gadget to be synchronized with a phone or tablet, increasing the potential of changing settings for the drone while it is in flight, such as the size or quality of the recorded multimedia, and information on the machine's status (battery status, connection to GPS altitude speed). During the flight, you can also get a live preview of the camera view, record and download movies and pictures. In the event that the controller's connection is lost, the GPS receiver with software enables an independent return

to the starting location. Drones may also detect locations where flying are banned (such as near an airport) and alert the controller. The drone's brain is a camera with a picture resolution of 14 Megapixels, 1080p video recording, a diagonal of 1/2.3" matrix, and a field of vision of 110°/85°. JPEG and RAW formats are used to store photos, making them easier to understand. After fitting the drone with a variety of cameras and the necessary software, the camera may be used to map difficult-to-reach regions.

Figure 1: Illustrates the representation of DJI Phantom Vision 2[7]

e. Military drones:

Figure 2 shows an example of a military drone, the MQ-1 Predator (M- stands for multirole aircraft, and Q stands for drones) (Unmanned Combat Aerial Vehicle). The focus in the equipment is on observational tools. Thermal imaging and infrared imaging, as well as high-resolution cameras, were utilized. The drone's components are as follows:

1. 115 horsepower Rotax four-cylinder engine
2. Ku-band communications antenna
3. GPS navigation system with two internal GPS antennas
4. Fuel cell systems,
5. A camera and encoder system
6. A slot for the transmitter, receiver, and radar antenna.

Figure 2: Illustrates the representation of MQ-1 Predator [8]

1.2 Posibilities of using the drones:

Unmanned vehicles are excellent for patrolling vast regions and may be used to safeguard property as well as state boundaries. They may also take aerial photos for geodesy, archaeology, advertising, and other reasons. They can fly through barriers, buildings, and even to rooms, via open gates, windows, and doors, because to their tiny size and excellent agility. Models with thermal and night vision cameras (using infrared active or reinforcing starlight) may be employed as prospecting machines in rescue operations, with daily monitoring of the selected region and the ability to work 24 hours a day over wooded areas. They send a picture in real time, enabling essential services to respond quickly in the event of an emergency, an accident, or a crisis scenario that necessitates assistance. The following services, industries, and businesses may benefit from them:

a) Fire brigade:

- Actions to combat forest fires, floods, road, rail, and air catastrophes need vision support.
- Using thermal imaging to determine the conductivity of flames.
- Thermal detection of fire sources.
- Tracking and monitoring of pollution sources.
- Support for the moveable operating position/command.

b) Police:

- Communication catastrophes service.
- Patrolling a specified area.
- Traffic congestion documentation and traffic jams.
- Operation and monitoring of large events.
- Support for pursuit, searching, and other police operations.
- Evidence collection.

c) Border guards:

- Border area surveillance.

- Air support for border traffic management.
- Area visualization and mapping in real time.
- Detection and monitoring of pollution sources and objects, as well as land and water borders.
- Tracking moving targets.

d) Army:

- Reconnaissance and surveillance.
- Direct assistance for combat and training missions.
- Intelligence sharing.
- Tracking a moving target.
- Terrorism.

e) Energetic and chemical industry:

- Level gas emissions, fumes, and other hazardous or unwanted chemicals are monitored, diagnosed, and analyzed.
- Thermal detection of fire sources is detected.
- Production, technology, and logistic operations are monitored.
- Infrastructure of the defined region is controlled.

f) Geodesy companies:

- Area visibility and control in a short amount of time.
- Mapping.

g) Advertising Businesses:

- Commercials.
- Photos from commercials.
- Promotional materials.
- Drones are increasingly being used to deliver packages.

1.3 Risks associated with the use of drones:

Drone usage on a big scale is fraught with danger. The most serious risk is a drone falling from a considerable height, which may occur for a variety of reasons, including:

- Battery discharge.
- Weather-related damage (low air temperature, precipitation).
- Colliding with an object (tree, building, high-voltage line).

Because these dangers may be anticipated, steps should be made to prevent them from manifesting. The system can manage the battery condition and other telemetry data, such as temperature, from afar. If one of the parameters is exceeded, an alert should be triggered. This will enable you to take action, such as recalling the drone to a branch in an emergency. The sensors and software that constantly update the route depending on the flight path and identified impediments, on the other hand, are responsible for obstacle avoidance[9], [10].

Privacy is one of the most significant concerns connected with the widespread deployment of civilian drones. These gadgets have the capability of tracking the monitored item and seeing it from a variety of angles. They can be outfitted with cameras, night vision devices, and various sensors to make snooping easier. While their widespread use by municipal agencies (particularly the police) to maintain control over the civilian population may represent a significant threat to human rights, Potential dangers connected with the widespread usage of drones need sophisticated solutions and careful regulation aimed at adequate privacy protection for people.

2. DISCUSSION

Many initiatives relating to the production of electricity are now being carried out. One of these is the California Lithium Battery project, which is working on a graphene battery. It stands out for its fast charging, biodegradability, and lightweight. Another example is the use of pure lithium anodes, which may improve battery capacity by fourfold while keeping the same size and weight. Drones powered by fuel cells are an alternative to lithium polymer accumulators. Electrochemically active chemicals that participate in electrode processes are fed from the outside to the cell, and the reaction products are returned to the outside in this kind of cell. As a result, the fuel cell operates as long as fuel and oxidant are available. In one step, the energy conversion process overlaps, resulting in the production of electricity, waste heat, and water. Fuel cells weigh more than 3.5 times less than lithium-ion batteries with comparable characteristics. Attempts are being made to replace previously utilized cells with fuel cells due to considerably more favorable energy density characteristics.

3. CONCLUSION

A drone is a remotely controlled flying device that can capture pictures, record movies, and transport goods, among other things. It may be used to record wild animals in zoos. It may be used to monitor a vehicle that is breaking traffic regulations. Weather forecasting is one of the most significant applications of drones. This has once again given fresh life to the idea of forecasting weather conditions. These drones can gather vital data that may help in weather forecasting thanks to their advanced cameras and sensors. Drones may also be utilized in agriculture. Unmanned aerial vehicles (UAVs) simplify a variety of tasks, including commercial deliveries, mapping, and search and rescue. These technologies speed up data gathering and decrease the burden of enforcement teams, in addition to the economic advantages they provide. As a result, drone technology has a promising future.

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