

DOCUMENT

COURSE: Data Science, ASSIGNMENT 01
General Report on Surveillance Drone

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Surveillance Drones

Unarmed military UAVs used for intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) are known as manned surveillance and reconnaissance aircraft. This kind of technology is not intended to transport aircraft ammunition like missiles, ATGMs, or bombs for drone strikes, in contrast to unmanned combat aerial vehicle (UCAV). To offer battlefield intelligence is the key goal. The term "miniature UAV" refers to small, short-range, man-portable unmanned aerial vehicles that are also utilized for combat intelligence. ?? [1]



Figure 1: Surveillance Drone

1 Introduction

A drone is a type of unmanned aerial vehicle (UAV), which is an aircraft without a human pilot, crew, or passengers. UAVs were initially created in the twentieth century to perform military tasks deemed "dull, dirty, or dangerous" for humans. By the twenty-first century, they had evolved into vital tools for the majority of militaries. Control technologies' use increased to several non-military applications as they became more affordable and effective. Aerial photography, precision agriculture, river monitoring, environmental monitoring, policing and surveillance, infrastructure inspections, goods smuggling, entertainment, and drone racing are a few of these applications. [2]



Figure 2: Modern UAV

1.1 History

EARLY DRONES A balloon carrier, a forerunner of the aircraft carrier, was used in the first offensive air power usage in naval aviation in July 1849, marking the oldest known deployment of an unmanned aerial vehicle for combat. Around 200 incendiary balloons were attempted to be launched at Venice by Austrian forces besieging the city. Most of the balloons were released from the ground, but several were also released from the Austrian ship SMS Vulcano. At least one bomb was dropped into the city, but most balloons missed their targets and others floated back over Austrian defenses and the launch ship Vulcano as the wind changed after launch.



Figure 3: Early Drones

World War II Denny founded the Radioplane Company in 1940, and other models were developed throughout World War II and utilized for both assault missions and antiaircraft gunner training. During the war, Nazi Germany created and employed a variety of unmanned aerial vehicles, including the Argus As 292 and the V-1 flying bomb with a jet motor. Although the Armistice with Italy was signed before any operational deployment, fascist Italy developed a specialized drone variant of the Savoia-Marchetti SM.79 flown by remote control.

Postwar period Following World War II, research and development proceeded on vehicles like the 1951 Teledyne Ryan Firebee I, the Australian GAF Jindivik, and the American JB-4 (using television/radio-command navigation). Companies like Beechcraft also offered its Model 1001 for the U.S. Navy in 1955. But up to the Vietnam War, they were only remote-controlled aircraft. The U.S. Air Force started preparing for the employment of uncrewed aircraft in 1959 out of worry for losing pilots over unfriendly area.



Figure 4: Modern UAV

Modern UAVs Interest in UAVs increased within the top echelons of the U.S. military as a result of the maturing and shrinking of relevant technologies in the 1980s and 1990s. The American Department of Defense awarded AAI Corporation and Israeli firm Malat a contract in the 1990s. The AAI Pioneer UAV, which AAI and Malat jointly created, was purchased by the U.S. Navy. Several of these UAVs were used in the Gulf War of 1991. UAVs showed the potential for less expensive, more powerful fighting vehicles that could be deployed without endangering aircrews. In the early versions, observation aircraft were the main focus, although some also carried weapons, such as the General Atomics MQ-1 Predator, which could fire AGM-114 Hellfire air-to-ground missiles.

2 Design

Crewed and uncrewed aircraft of the same type generally have recognizably similar physical components. The main exceptions are the cockpit and environmental control system or life support systems. Some UAVs carry payloads (such as a camera) that weigh considerably less than an adult human, and as a result, can be considerably smaller. Though they carry heavy payloads, weaponized military UAVs are lighter than their crewed counterparts with comparable armaments.

2.1 Aircraft configuration

UAVs can be designed in different configurations than manned aircraft both because there is no need for a cockpit and its windows, and there is no need to optimize for human comfort, although some UAVs are adapted from piloted examples, or are designed for optionally piloted modes. Air safety is also less of a critical requirement for unmanned aircraft, allowing the designer greater freedom to experiment. Instead, UAVs are typically designed around their onboard payloads and their ground equipment. These factors have led to a great variety of airframe and motor configurations in UAVs.

For conventional flight the flying wing and blended wing body offer light weight combined with low drag and stealth, and are popular configurations for many use cases. Larger types which carry a variable payload are more likely to feature a distinct fuselage with a tail for stability, control and trim, although the wing configurations in use vary widely.

2.2 Propulsion

Traditional internal combustion and jet engines remain in use for drones requiring long range. However, for shorter-range missions electric power has almost entirely taken over. The distance record for a UAV (built from balsa wood and mylar skin) across the North Atlantic Ocean is held by a gasoline model airplane or UAV. Manard Hill "in 2003 when one of his creations flew 1,882 miles across the Atlantic Ocean on less than a gallon of fuel" holds this record.[76]

Besides the traditional piston engine, the Wankel rotary engine is used by some drones. This type offers high power output for lower weight, with quieter and more vibration-free running. Claims have also been made for improved reliability and greater range.



Figure 5: Surveillance Drone

2.3 Ornithopters – wing propulsion

Flapping-wing ornithopters, imitating birds or insects, have been flown as microUAVs. Their inherent stealth recommends them for spy missions.

Sub-1g microUAVs inspired by flies, albeit using a power tether, have been able to "land" on vertical surfaces.[77] Other projects mimic the flight of beetles and other insects.

3 Working Principle

Unmanned aerial vehicles (UAVs) that use four rotors to provide lift are known as surveillance drones. Two rotors are located on either side of the drone in a quadcopter design. The drone's inbuilt computer regulates the rotors' rotational speed and direction, allowing it to fly in any direction. Payload: A payload of sensors, such as cameras, radar, or thermal imaging sensors, is frequently carried by surveillance drones. The drone can gather data about the area it is monitoring thanks to these sensors. A radar sensor, for instance, can be used to detect movement, while a camera can be used to identify people or things. Control: A pilot often operates surveillance drones.



Figure 6: Surveillance Drone

4 Application

Drones for surveillance can be used to keep an eye on big areas for security. They can be used, for instance, to police borders, keep an eye on crowds, or look for those who have gone missing. Rescue efforts: Missing persons or items in hard-to-reach regions can be found using surveillance drones. For instance, they can be used to look for survivors following a natural disaster or to look for wandering hikers. Map-making: Maps of vast areas can be made using surveillance drones. This might be helpful for activities like organizing building projects or keeping track of environmental changes. Agriculture: Crops and cattle can be observed with surveillance drones. They can be used, for instance, to count cattle, evaluate crop health, or find pests. Infrastructure: Watchfulness



Figure 7: Surveillance Drone

5 Conclusion

Drones for surveillance are a flexible instrument that may be applied to many different tasks. They are a great tool for many organizations since they are affordable, adaptable, and scalable. Nevertheless, there are several possible disadvantages to the use of surveillance drones, such as safety risks and privacy issues. Before choosing whether or not to employ a drone for a particular application, it is crucial to thoroughly consider the advantages and disadvantages.



Figure 8: Surveillance Drone

References

- [1] “Mathis lichtenberger.” <https://www.chatpdf.com/>, 2023. Accessed on August 4, 2023.
- [2] B. P. Tice, “Unmanned aerial vehicles – the force multiplier of the 1990s,” *Airpower Journal.*, 2009.