Assignment 2

Unmanned Aerial Vehicle (UAV)

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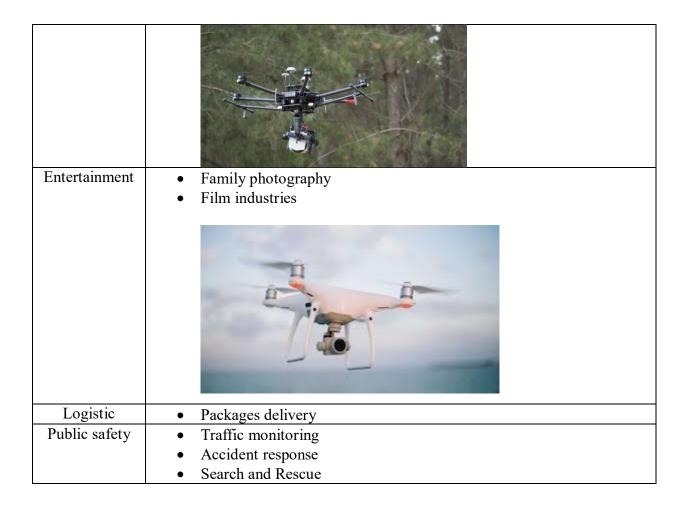
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History Of UAV

1849	Austrian use unmanned balloons for bomb attacks
1898	Nikola Tesla demonstrates remote control of a boat
1915	1st development of UAV by US military, Kettering Bug
1944	First combat use of UAVs by the German
1960	Development of drones in US military
1980	Development of predator drone for surveillance
2000	Increased use of armed drones in military
Current time	Development of commercial drones for personal and professional use such as mapping, photography, search and rescue and delivery service.

Application of UAV

Industries	Application	
Agriculture	 Crop monitoring Crop mapping Fertilizer spraying 	
Environmental Care	Forest mappingWildlife monitoring and rescue	



Main Components of UAV

1. Airframe Design

- The body of the UAV that gives structure support and aerodynamics.

Types	Advantages	Disadvantages
Fixed-Wings -UAV designed as a plan, usually used for surveillance, mapping and military purpose	 Efficient for long-duration flight Can cover larger areas Can carry heavy payloads Less affected by wind Less power consumption 	 Need a runway or a catapult launch and parachute or runway landing making them less flexible during takeoff and landing Higher maintenance Cannot hover at 1 place at a long time making them less useful in

	<u> </u>	-
		certain
		application
Rotary-Wings	 Can take off and 	 Less efficient for
-An UAV that is	landing vertically	long-duration flight
designed as a	making them more	 Can hold smaller
helicopter	efficient	playload
	- Have more	- More power
	maneuverable than	consumption than
	fixed wing	fixed-wing UAV
	- Can hover at 1 place	- More expensive to
	longer and at low speed	buy and maintain
	good for surveillance	than fixed-wing UAV
	rescue and monitoring	
Hybrid	- Having both features of	- Complex design
-A marriage	fixed-wing and rotary-	 Potentially higher
between fixed-	wing	cost
wing and rotary-	- Combine the benefits of	
wing UAV which	both	
shares both		
capabilities		
Multirotor	- Can fly in place at low	- Short flight time than
-Uses multiple	speed, making useful	other UAVs
rotor to lift and	for precise positioning	 Limited payload,
localize.	- Not more expensive	cannot carry heavy
	than all others UAV	sensors
	- Simple to handle and	- Easily effected by
	maintain	winds

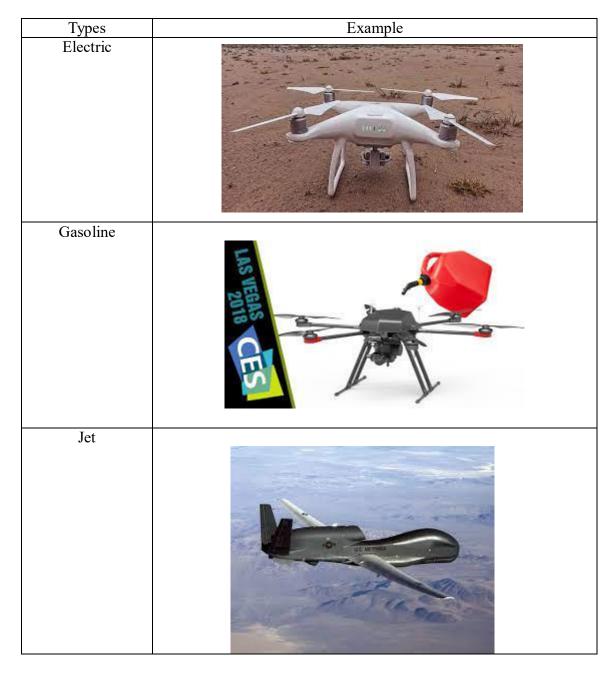
Types	Example UAVs
Fixed-wings	

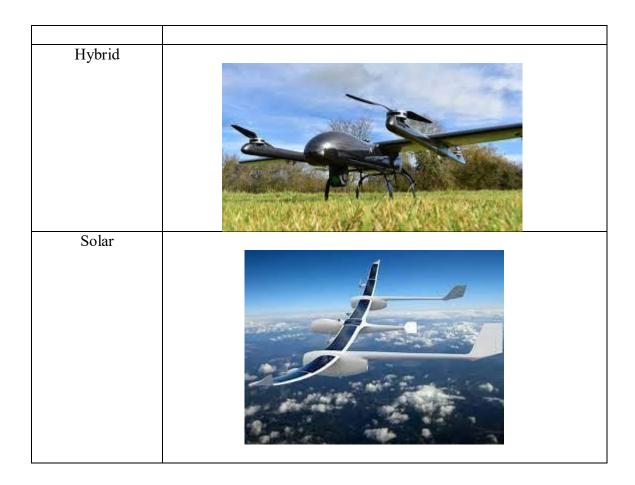


2. Propulsion System

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Type	Advantages	Disadvantages
Electric	- Quite	- Shorter time flight
	- Efficient	 Limited payload
	 Low maintenance 	capacity
	- Suitable for small	- Frequent battery change
	UAVs	
Gasoline	- High power output	- Noisy
	 Longer flight time 	- Higher maintenance
	 Good for larger UAVs 	- Fuel storage issue
Jet engine	 High speed and high- 	- Complex design
_	altitude capability	- Expensive
	- High performance	- High fuel consumption
	UAVs	_

	- Suitable for military	
	use	
Hybrid	- Combine features of	 Complex design
-	multiple propulsion	- Higher cost than most
	types	UAVs
	- Provides benefits of all	
	those types	
Solar	- Green power source	- Limited power source (sun)
	 Longer flight time than 	- Higher cost
	battery	
	- Good for environment	





3. Navigation system UAVs can be controlled using remote control, mobile apps as well as autonomously

Types	Description	Example
Remote Control	 Most command type of control The handler uses remote control device to communicate and navigate the drone. Controlled using Radio wave signal Precise control of altitude and position Suitable for photography and videography 	

Mobile Apps	 User friendly interface Drones can be controlled using smartphone Easy access to automatic flight mode and camera settings 	る。
Autonomous	 Perform task without humas intervention Ideal for dangerous task and forest mapping Equipped with advanced sensors such as camera, IMU, GPS reciver, Radar Altimeter to collect data and perform real-time analysis 	

4. Data transmitter:

There are several sensors that are used in data collection of UAVs for variety of applications such as mapping, surveying, agriculture, and environmental monitoring.

Types of sensors	Application
RGB cameras	capture visible light and are used for aerial photography
	and videography.
Thermal camera	capture infrared radiation and are used for detecting heat
	signatures, such as in search and rescue operations or
	building inspections.
LiDAR Sensor	use laser beams to measure distances and create 3D maps
	of the environment.
Multispectral	capture data across multiple wavelengths of light and are
sensor	used for crop monitoring and environmental monitoring.
Gas sensor	detect the presence of gases in the environment and are
	used for environmental monitoring and industrial
	inspections.

Data receivers:

- Some UAVs are equipped with onboard storage to store data locally such as internal storage.
- UAVs are able to transmit data in real-time to a ground station or other receiver using wireless communication technologies such as Wi-Fi, Bluetooth, or cellular networks
- Ground station commonly consists of computers, software and communication link to the UAVs to receive and process the data.
- The software then analyzes the data collected and draws the map and input data to the system by using the data collected.

5. Power Source

Types	Advantages	Disadvantages
Lithium polymer	 High energy density 	Limited flight time
(LiPo) battery	 Lightweight 	 Risk of fire and
	 Rechargeable 	explosion
Gasoline	 High power Output 	Heavy
	 Long flight time 	 Noisy
	 Easily obtained 	• Emission
Jet fuel	 High power Output 	• Expensive
	 Long Flight time 	 Requires specialized
	 Widely available 	handling
Solar Cell	 No fuel required 	Limited power output
	 Good for long time 	 Limited power source
	flight	(sun light)
Hydrogen Fuel	 Efficient and Clean 	 Limited technology
cell	power source	available
		 Higher cost



LiPo battery drone



Gasoline drone



Solar cell drone