
UNMANNED AERIAL VEHICLE (UAV)

Here is where your presentation begins

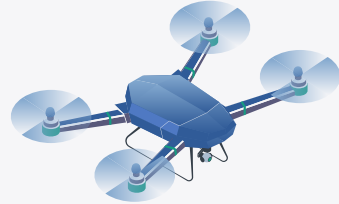
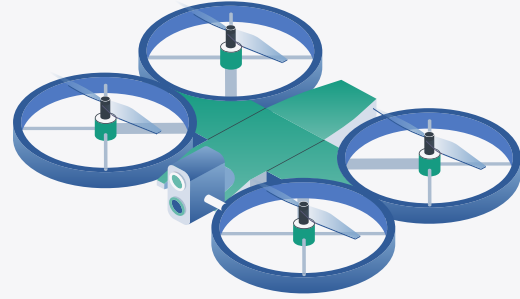


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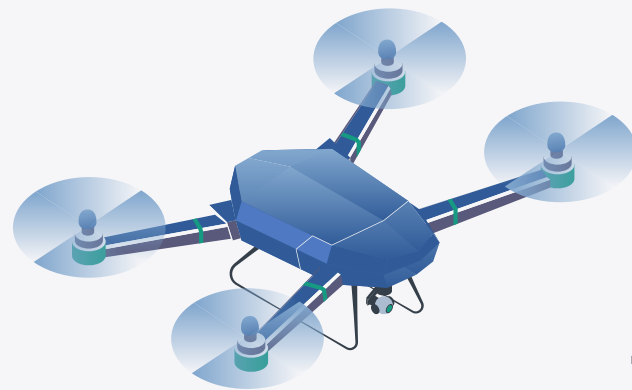
MAIN COMPONENT




01

HISTORY


You can enter a subtitle here if you need it



WHAT IS UAV?

- 
- Short form for Unmanned Aerial Vehicle.
 - Controlled either by a remote operator on the ground or autonomously by an on-board computer.
 - Can reach hazardous areas without endangering human life.
 - Development and use of UAVs are rapidly evolving and have the potential to transform many industries and aspects of society.

HISTORY OF UAV



1989
Austrians use
unmanned balloons
for bomb attacks



1915
The first modern UAV, the
Kettering Bug is developed on
World War 1



1950
The US begins
experimenting with UAVs
for surveillance purposes



1970
The first UAVs are
used for battlefield
surveillance in the Yom
Kippur War



21st Century
UAVs become more sophisticated and
capable of performing complex tasks, and are
used in a wide range of fields including
agriculture, journalism, and filmmaking



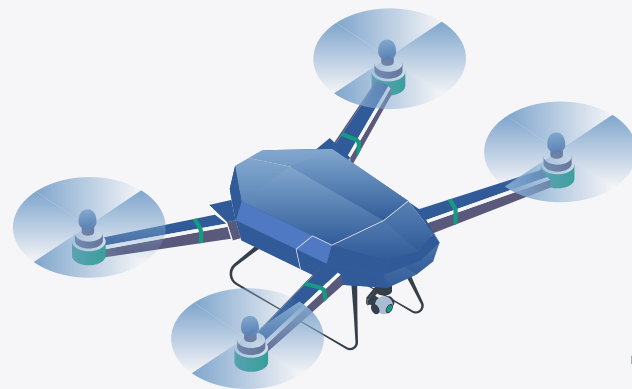
1990
UAVs are used for civilian purposes such as
environmental monitoring and disaster relief



02

APPLICATION

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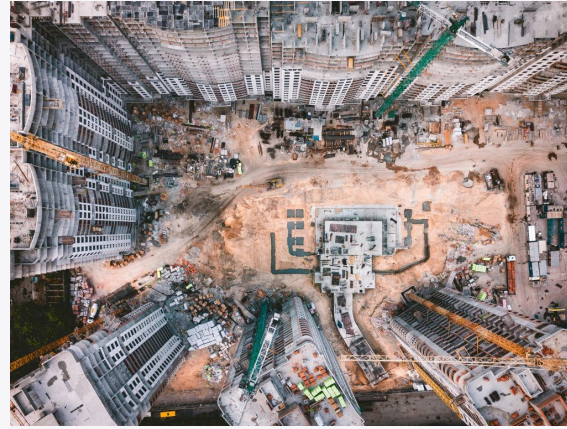


APPLICATIONS

Delivery and logistics	<ul style="list-style-type: none">• Package and parcel delivery
Construction and engineering	<ul style="list-style-type: none">• Inspection and site surveying• Progress monitoring and reporting• Infrastructure maintenance and repair
Media and entertainment	<ul style="list-style-type: none">• Cinematography and videography• Live event coverage and broadcasting
Agriculture	<ul style="list-style-type: none">• Crop monitoring• Mapping agriculture aree
Law enforcement	<ul style="list-style-type: none">• Capture image of a crime scene• Crowd Control at certain area



DELIVERY APPLICATION



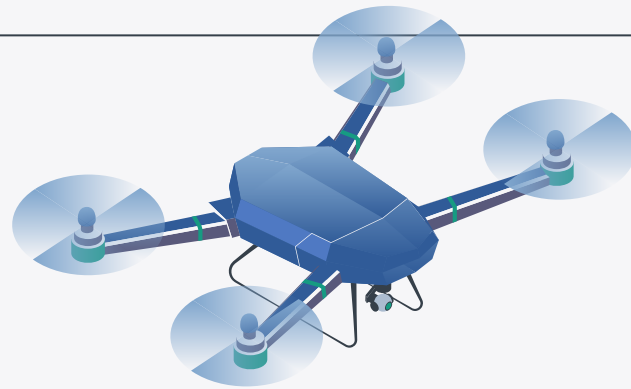
CONSTRUCTION APPLICATION : VIEW TAKEN FROM UAV



AGRICULTURE : PESTICIDE SPRAYING

03

MAIN COMPONENTS



MAIN COMPONENTS



AIRFRAME DESIGN



PROPULSION



NAVIGATION



**DATA COLLECTION &
TRANSMISSION**

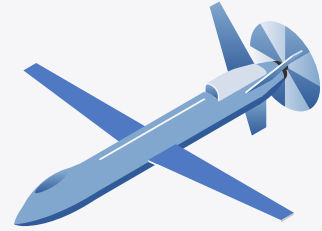


POWER MANAGEMENT



AIRFRAME DESIGN

UAV has several types of shape and design



1. Fixed Wing

- The design similar to the plane
- It used for surveillance, mapping and military.

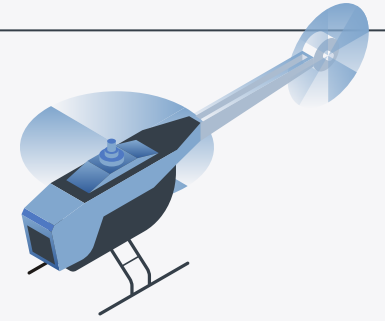
ADVANTAGE	DISADVANTAGE
Ability to fly at high altitude and high speed	Cannot hover at in one place
Energy efficient	Only useful in larger operating area
Has higher payload capacity	Need more maintenance



General Atomics MQ-9 Reaper

- Medium-to-high altitude, long-endurance UAV.
 - Used for military and intelligence missions.
 - Capable of carrying a variety of weapons and sensors, and has a maximum endurance of over 27 hours.
 - Wingspan : 66 feet
 - Max speeds : up to 300 knots (345 mph).
 - It is operated remotely from a ground control station
 - Applications : reconnaissance, surveillance, and precision strikes against enemy targets.
-

AIRFRAME DESIGN



2. Rotary-wing

- The design and fly similar to the helicopter
- Larger and more complex
- Use for search, rescue operation

ADVANTAGE	DISADVANTAGE
Can hover in one place	Environmental factor give a huge effect of flying
Can land and take off vertically	Expensive in purchasing and maintenance
Can operated in confined space	Low payload capacity



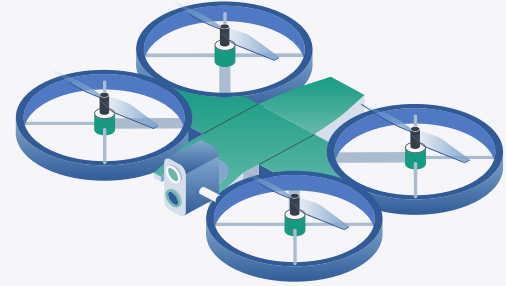
YAMAHA RMAX

- designed for agricultural purposes, such as crop spraying and monitoring.
- It has a maximum flight time about 2 hours and can cover up to 6 hectares per flight.

AIRFRAME DESIGN

3. Multicopter

- Equip with multiple rotors to lift and propulsion
- Has variety of configuration of number of rotors



ADVANTAGE	DISADVANTAGE
Simple to operate	Has a limitation to operated far and fast
Can land and take off vertically	Only capable for low payload capacity
Inexpensive	Noisy



DJI PHANTOM 4 PRO

- For aerial photography and videography.
- It comes with a remote controller that features a built-in 5.5-inch 1080p display, which displays real-time flight telemetry, including altitude, speed, and battery life.
- Equipped with an advanced obstacle avoidance system that uses five cameras, GPS, and GLONASS positioning to detect and avoid obstacles in its path.
- Can fly at a maximum speed of 45 miles per hour and has a maximum flight time of up to 28 minutes, depending on the weather conditions and flight mode.

AIRFRAME DESIGN

4. Hybrid

- Combination of features from Fixed-wing and Rotary-wing
- Has variety of configuration and design
- Usually

ADVANTAGE	DISADVANTAGE
Can land and take off vertically	Most complex and expensive
Can combine the benefit of rotary and fixed wing	Added weight and complexity of tilt rotor and tilt wing will reduced payload capacity
Transition to fixed wing flight will created a greater endurance and area of flight	Complexity requires special training



Silent Arrow GD-2000

- Design to optimize its payload capacity and range.
- Combines a lightweight, carbon-fiber structure with a detachable, high-lift wing section
- Wing section is made of high-strength, lightweight materials and can be detached from the main body of the drone for easy transport and storage.
- Capable of carrying payloads of up to 1,631 pounds over distances of up to 120 nautical miles
- Well-suited for a range of cargo delivery applications.

PROPULSION

Propulsion Type	Pros	Cons	Example
Electric	Quiet, efficient, low emissions	Shorter flight times, limited payload capacity	DJI Mavic 2 Pro
Gasoline	More power, longer flight times	Louder, more emissions	Yamaha RMAX
Jet	High speeds, high altitude capabilities	Louder, more expensive to operate	MQ-9 Reaper
Hybrid	Flexible, efficient	More complex, higher cost	Northrop Grumman Firebird
Solar	Unlimited flight times, environmentally friendly	Slower, limited payload capacity	Sunseeker Duo



DJI Mavic 2 Pro



Yamaha RMAX



MQ-9 Reaper



Northrop Grumman Firebird



Sunseeker Duo

NAVIGATION



Navigation System	Description
GPS	Uses a network of satellites to determine the UAV's precise location and altitude.
INS	Uses accelerometers and gyroscopes to calculate the UAV's position, velocity, and orientation. Useful in situations where GPS signals may be blocked or degraded.
Optical flow sensors	Measures the movement of the ground or other objects to estimate the UAV's speed and position.
Barometric sensors	Measures air pressure to determine the UAV's altitude.
Radar Altimeter	Uses radar waves to measure the distance between the UAV and the ground below it. This allows the system to determine the UAV's altitude above the ground

All of it can be applied in conjunction with one another.

DATA COLLECTION

Below is the example of data collection by UAV:

- **Aerial photography:** Capture high-resolution aerial images that can be used for mapping, surveying, and monitoring. These images can be used to create orthophotos that can be used for accurate measurements. Ex: **Sony RX1R II**
- **Video footage:** Capture high-quality video footage that can be used for monitoring, inspection, and surveillance purposes. Ex: **DJI Zenmuse Z30**
- **Thermal imagery:** UAVs equipped with thermal sensors can capture thermal images of the target area for used like monitoring wildlife, detecting heat loss in buildings, and identifying areas of high heat in forest fires. Ex: **DJI Zenmuse H20N**
- **LiDAR data:** Light Detection and Ranging (LiDAR) sensors can be mounted on UAVs to collect highly accurate 3D data of the terrain and objects on the ground. Used for topographic mapping, forestry, and urban planning. Ex: **Velodyne Puck LITE**
- **Spectral imagery:** UAVs equipped with multispectral or hyperspectral sensors can capture spectral data of the target area, which can be used for various applications such as precision agriculture, environmental monitoring, and mineral exploration.



DATA TRANSMISSION



METHOD	DESCRIPTION	Range
Radio communication	Uses an RF link to transmit data	Short to medium range (up to several kilometers)
Satellite communication	Uses a satellite link to transmit data	Long range (global coverage)
Cellular communication	Uses a cellular network to transmit data	Medium range (up to several kilometers)
WiFi communication	Uses a WiFi link to transmit data	Short range (up to several hundred meters)



METHOD	Advantages	Disadvantages
Radio communication	Reliable, good range and data transfer rates	Limited range compared to satellite communication
Satellite communication	Reliable for long-range operations	Higher cost compared to radio communication
Cellular communication	Good for urban areas with good cellular coverage	May not be reliable in remote or rural areas
WiFi communication	Good for short-range operations in urban areas or indoor environments	Limited range compared to other methods

POWER MANAGEMENT

1. BATTERY

- DJI Mavic Air 2
 - Use LiPo 2s battery
 - Capacity about 3500 mAh
 - Flight time : 34 min
 - Speed : 42.5 mph
 - Voltage : 11.55 V
 - Max charging power : 38 W

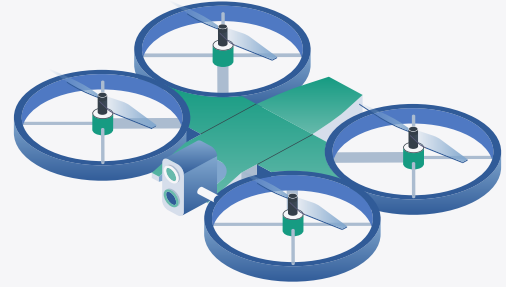


POWER MANAGEMENT

2. HYBRID/ENGINE

- Very popular because combine two power source, battery and conventional fuel-based power.
- increase the range and endurance of the UAV, improve fuel efficiency, reduce emissions, and increase the flexibility of the UAV's operations
- Ex: Skyfront perimeter 8
 - Powered by engine and has backup battery for emergency.
 - Starting the engine from battery and engine will powering the electronics.
 - Use G2K proprietary hybrid gasoline-electric propulsion system





THANK YOU

