

2.1 CLASSIFICATIONS OF THE UAV

Unmanned Aerial Vehicles (UAVs), commonly referred to as drones, are classified based on several factors, including their size, weight, range, flight altitude, and purpose. Below is a general classification of UAVs:

1. Classification by Size and Weight

UAVs can be classified by their physical dimensions and weight into several categories:

a. Micro and Nano UAVs:

- **Weight:** Less than 2 kg
- **Uses:** Indoor surveillance, hobby flying, close-range photography
- **Examples:** DJI Mini-series, Parrot Mambo

b. Mini UAVs:

- **Weight:** 2–20 kg
- **Uses:** Photography, recreation, environmental monitoring, agriculture
- **Examples:** DJI Phantom, Parrot Anafi, fixed-wing mini drones

c. Small UAVs:

- **Weight:** 20–150 kg
- **Uses:** Industrial inspections, advanced surveillance, scientific research
- **Examples:** AeroVironment RQ-11 Raven

d. Medium UAVs:

- **Weight:** 150–600 kg
- **Uses:** Military surveillance, border patrol, tactical missions
- **Examples:** Boeing ScanEagle

e. Large UAVs:

- **Weight:** Over 600 kg
- **Uses:** Military strike missions, long-range surveillance, high-altitude research
- **Examples:** General Atomics MQ-9 Reaper, Northrop Grumman Global Hawk

2. Classification by Range

Based on the operational range, UAVs are classified as:

a. Very Close-Range UAVs:

- **Range:** Up to 5 km
- **Flight Duration:** Less than 1 hour
- **Uses:** Short-range monitoring, indoor missions
- **Examples:** Mini drones, hobby drones

b. Close-Range UAVs:

- **Range:** 5–50 km
- **Flight Duration:** 1–6 hours
- **Uses:** Industrial inspection, tactical operations
- **Examples:** Parrot Disco, DJI Matrice series

c. Short-Range UAVs:

- **Range:** 50–150 km
- **Flight Duration:** 6–12 hours
- **Uses:** Border patrol, surveillance, environmental monitoring
- **Examples:** AeroVironment Puma

d. Mid-Range UAVs:

- **Range:** 150–650 km
- **Flight Duration:** 12–24 hours
- **Uses:** Military reconnaissance, scientific data gathering
- **Examples:** IAI Heron, Turkish Bayraktar TB2

e. Endurance/Long-Range UAVs:

- **Range:** Over 650 km (up to thousands of km)
- **Flight Duration:** Over 24 hours
- **Uses:** Strategic intelligence, combat missions, long-distance logistics
- **Examples:** Northrop Grumman Global Hawk, General Atomics MQ-1 Predator

3. Classification by Altitude

UAVs are also classified based on the altitude they can achieve:

a. Low-Altitude UAVs (Up to 5,000 feet):

- **Uses:** Agriculture, environmental surveys, firefighting
- **Examples:** DJI Agras, SenseFly eBee

b. Medium-Altitude UAVs (5,000–30,000 feet):

- **Uses:** Surveillance, scientific missions, mapping
- **Examples:** MQ-9 Reaper, Turkish Anka

c. High-Altitude UAVs (Above 30,000 feet):

- **Uses:** Strategic military surveillance, atmospheric studies, communication relays
- **Examples:** Global Hawk, Boeing Phantom Eye

4. Classification by Purpose

UAVs are categorized by their primary mission:

****a. Civilian/Commercial UAVs:**

- **Uses:** Aerial photography, agriculture, delivery services, mapping, research
- **Examples:** DJI Inspire, Amazon Prime Air drones

****b. Military UAVs:**

- **Uses:** Intelligence, surveillance, reconnaissance (ISR), combat missions
- **Examples:** MQ-1 Predator, MQ-9 Reaper, Wing Loong

****c. Special-Purpose UAVs:**

- **Uses:** Search and rescue, disaster relief, medical supply delivery
- **Examples:** Zipline drones for medical supply, UAVs for firefighting

****d. Recreational UAVs:**

- **Uses:** Hobby flying, drone racing, personal use
- **Examples:** DJI Mavic, Parrot Bebop

5. Classification by Type of Flight

UAVs are also classified based on the mechanism they use for flying:

a. Fixed-Wing UAVs:

- **Characteristics:** Airplane-like structure, wings provide lift, long-range, high speed
- **Uses:** Long-distance missions, mapping, surveying
- **Examples:** Boeing Insitu ScanEagle

b. Rotary-Wing UAVs (Multicopters):

- **Characteristics:** Helicopter-like design, rotors provide lift, VTOL (Vertical Takeoff and Landing) capability
- **Uses:** Close-range aerial photography, inspections
- **Examples:** DJI Phantom, DJI Matrice

c. Hybrid UAVs:

- **Characteristics:** Combine fixed-wing and rotary-wing features for both VTOL and long-range flying
- **Uses:** Flexible missions requiring vertical takeoff and long endurance
- **Examples:** Quantum Systems Vector

6. Classification by Autonomy

UAVs are also divided based on their level of autonomy:

a. Remotely Piloted UAVs:

- **Characteristics:** Fully controlled by a human operator from a remote station
- **Examples:** Many consumer drones

b. Autonomous UAVs:

- **Characteristics:** Operate independently using pre-programmed routes, AI, and advanced sensors
- **Examples:** Some military drones, advanced research drones

c. Semi-Autonomous UAVs:

- **Characteristics:** Can perform autonomous functions but require occasional human intervention
- **Examples:** Many drones used for commercial purposes like agriculture or mapping

Conclusion

UAV classification varies depending on factors like size, range, altitude, purpose, flight mechanism, and level of autonomy. Each type serves specific needs, from recreational use to highly specialized military and scientific applications.