

THE INSTITUTE OF ENGINEERS (INDIA)
UP STATE CENTRE, LUCKNOW
ONE DAY SEMINAR
ON
“AI IN ACTION FROM CONCEPT TO REALITY”



EXPERT LECTURE
Artificial Intelligence Powered Drones: Revolution
in AIR

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LIST OF TOPICS

- 
- **Introduction**
 - **Understanding UAVs and AI**
 - **AI in Action**
 - **Search and Rescue**
 - **Precision Agriculture**
 - **Infrastructure Inspection**
 - **Delivery Drones**
 - **Future of AI & drones**
 - **Conclusion**

Understanding Artificial Intelligence

What is AI?

*Simulation as human intelligence in machine
Enabling systems to learn, reason and make
decisions.*



Drone:

*Machine learning Algorithms from data
Computer Vision:
enabling drones to see and understand*

Why UAVs (Unmanned Aerial Vehicles)

- Agility (ability to change speed, direction, and altitude both quickly and easily) and maneuverability (ability to change its flight path)
- Cost effective compared to man aircraft.
- Access to hazardous or remote areas
- Smaller in size and can achieve great speeds.

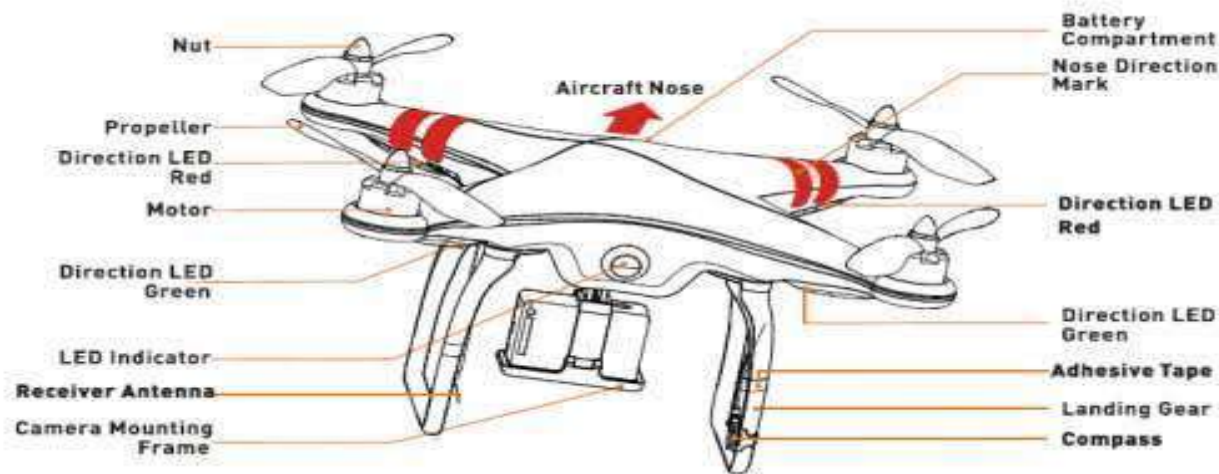


AI in Action: Empowering Drones

How AI is transformed drones

Autonomous flight

- Pre-programmed flight paths
- Obstacle avoidance
- Real-time path adjustment



Enhanced data collection

- Machine learning analysis of aerial imagery
- Object detection and classification

What is Drone?

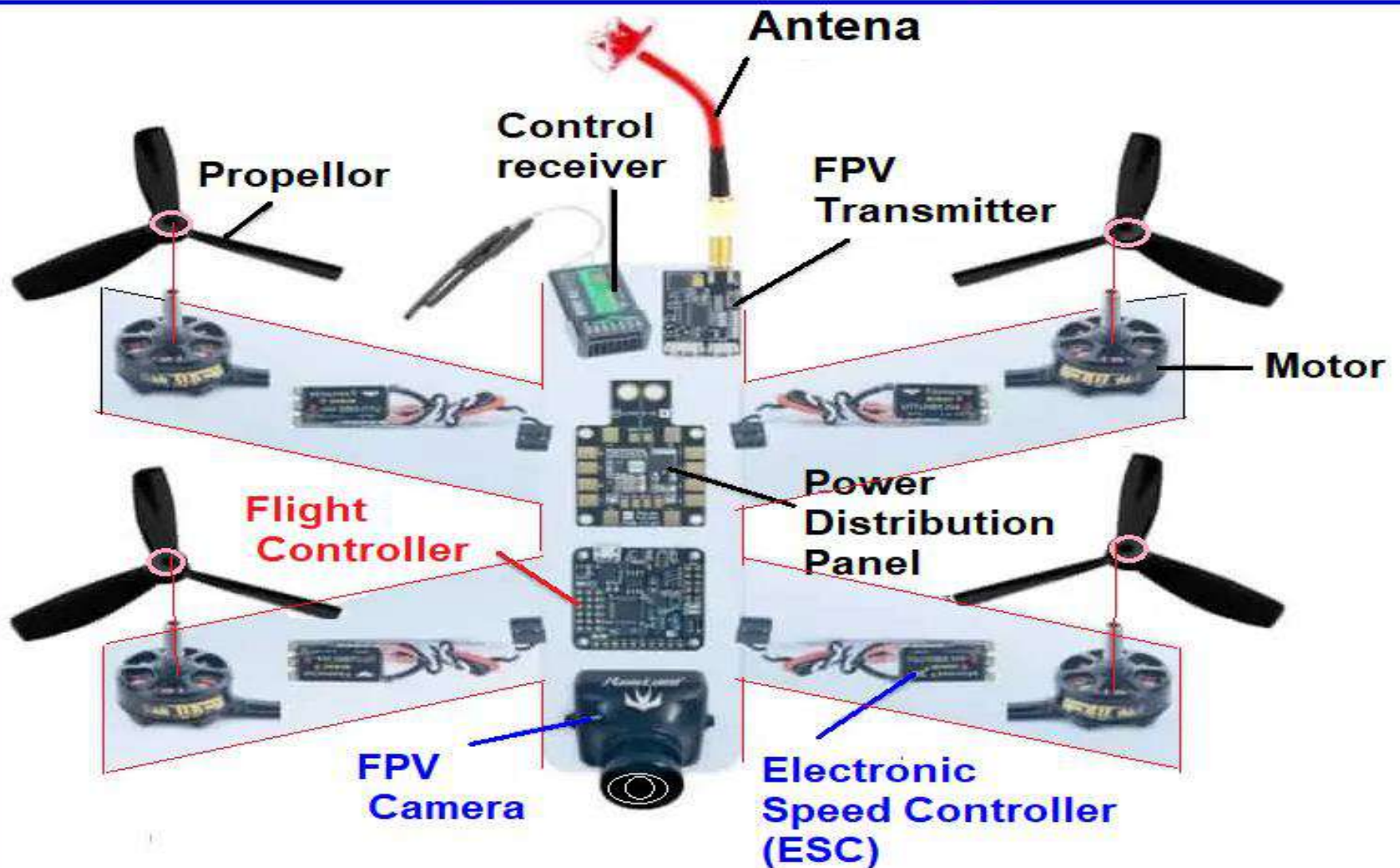
- Unmanned Aerial Vehicles (UAV).
- It is a aircraft operated without a human pilot on board.
- It can be remotely controlled or fly autonomously using pre-programmed flight plans or more complex dynamic automation systems.



Types of Drones

Components of a Drone

Parts of Drone



1. Categorization by Weight

- **Nano (250 grams):** No registration or pilot certificate required for recreational flying. Maximum altitude is restricted to **50 feet (15 meters)**.
- **Micro (250g to 2 kg): Registration required.** No license is required if flown purely for hobby purposes, but a certificate is needed if used commercially.
- **Small (2 kg to 25 kg):** Full registration, type certification, and a Remote Pilot Certificate (RPC) are mandatory.
- **Medium (25 kg to 150 kg) & Large (> 150 kg):** Industrial/logistics scale; requires complete certifications and strict operational permits.

2. Airspace Zones (The Color-Coded Map)

- **Green Zone (Fly Freely):** Open airspace up to **400 feet (120 meters)** above ground level. Registered drones can fly here without needing prior single-flight permission from the DGCA.
- **Yellow Zone (Controlled Airspace):** Airspace within an 8–12 km radius around airports or above 400 feet. You **must apply for flight clearance** via Digital Sky, which typically processes within 24 hours.
- **Red Zone (No-Fly Areas):** Strictly prohibited. Includes areas within 3–5 km of airport boundaries, international borders, military bases, and sensitive locations like the Parliament. Flying here without central government authorization is a major offense.

AIRSPACE ZONES CHECK WEBSITE LINK

- <https://digitalsky.aai.aero/digital-sky-map>

3. Core Operational Rules for All Pilots

- **Visual Line of Sight (VLOS):** Able to see the drone clearly with your naked eye at all times without using aids like binoculars or tracking screens.
- **Daylight Flight Only:** Night flying is forbidden unless a special DGCA waiver has been explicitly granted.
- **No Crowds or Public Events:** You cannot fly directly over people, moving vehicles, highways, or dense residential areas without permission.
- **No Drop-offs:** Not allowed to drop or deliver any objects from the payload unless operating a specific, DGCA-approved delivery system.

4. Mandatory Licensing & Compliance

- **Unique Identification Number (UIN):** Register the drone on the Digital Sky portal, pay the UIN fee, and **physically etch or sticker the UIN onto the drone frame** in a legible size.
- **Remote Pilot Certificate (RPC):** To get an RPC, you must be at least 18 years old, have passed Class 10th, and complete training at a DGCA-approved Remote Pilot Training Organisation (RPTO).
- **Third-Party Insurance:** Liability insurance is legally mandatory to cover any potential third-party property damage or personal injury caused by the drone.
- **NPNT (No Permission, No Takeoff):** Compliant drones are programmed with software linked to the Digital Sky framework. If the system doesn't digitally sign off on your location and parameters, the drone's motors simply will not arm.

Flying Rules

- Drone laws are strictly regulated by the **Directorate General of Civil Aviation (DGCA)**.
- Under the rules, operations are split by the drone's weight category and the specific airspace zone you fly in.

How to Confirm Your Exact Location

- Since university campuses often straddle multiple boundary lines depending on their distance from the airport's perimeter, you must verify your exact coordinates before flying.

<https://digitalsky.aai.aero/digital-sky-map>

DGCA drone rules India 2026

- The **NPNT (No Permission No Takeoff)** mandate is strictly enforced for all drones above the Nano category.
- **DGCA type certification** is mandatory for all commercial drones before they can be manufactured, sold, or operated.
- Import of fully assembled drones is **prohibited**, only drone components can be freely imported.
- **DGCA RPTO rules** have been streamlined — RPTO-certified training is now the only approved pathway to a Remote Pilot Certificate.
- Three drone corridors for BVLOS ((Beyond Visual Line of Sight) commercial operations have been approved — in Ladakh, Telangana, and Andhra Pradesh.

DGCA Drone Rules India 2026 for Agriculture Drone

- Agriculture drone rules **India** are designed to enable large-scale precision farming while maintaining safety.
- Using a drone to spray pesticides, herbicides, or fertilizers on crops, what the DGCA mandates:

Operator Eligibility

- Must be a citizen of India
- Minimum age: **18 years**
- Medically fit (as assessed under DGCA requirements)
- Must hold a valid **DGCA remote pilot certificate**

Operational Rules

- Fly only within **Visual Line of Sight (VLOS)**
- Maximum altitude: **400 feet (120 metres) AGL** in green zones
- Do not fly over populated areas, wildlife sanctuaries, or restricted zones
- Comply with the **Insecticides Act, 1968** for chemical spraying only CIBRC-approved pesticides and correct dilution rates
- Log every flight through the **Digital Sky drone registration** platform
- Obtain flight permission via the NPNT system before every takeoff

Steps to Get Your RPC

- Enrol at a DGCA-approved RPTO.
- Complete ground training and flying hours.
- Pass the Theory Test on the Digital Sky platform.
- Complete Simulator Test, Solo Flying, and Final Skill Test.
- Submit RPC application on Digital Sky.
- Download your digital RPC certificate.
- The RPC is valid for **10 years** and can be renewed through the Digital Sky platform.

<https://digitalsky.aai.aero/home>

Applications: Search and Rescue

Search and Rescue with AI

- Rapid coverage of large areas.
- Thermal imaging for finding people.
- Facial recognition for missing persons identification.



Applications: Precision Agriculture

Revolutionizing Agriculture:

- **Crop health monitoring:** Identify diseases and deficiencies.
- **Precision spraying:** Optimize pesticide and fertilizer use.
- Automated field mapping and yield estimation.



[https://](https://www.ars.usda.gov/research/programs/precision-agriculture/)

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Applications: Infrastructure Inspection

Infrastructure Inspection with AI:

- Access to hard-to-reach areas.
- AI powered damage detection
- Faster and more cost effective inspections.



Applications: Delivery Drones

The future of Delivery:

- Autonomous deliveries to remote access
- Faster and more efficient delivery times.
- Considerations: Safety regulations, public perceptions.



Indian Drones

1. Defense and Military Drones

Drone	Developer	Primary Use
TAPAS BH-201	DRDO	Intelligence, Surveillance, Reconnaissance (ISR)
Rustom-II	DRDO	Medium Altitude Long Endurance (MALE) UAV
Archer-NG	DRDO	Tactical surveillance
Nishant	DRDO	Battlefield reconnaissance
Lakshya	DRDO	Target drone for weapons training
Abhyas	DRDO	Target drone
Nagastra-1	Solar Industries	Precision strike missions

2. Commercial and Industrial Drones



Drone	Company	Applications
SWITCH UAV	ideaForge	Surveying, mapping, defense
NETRA V4	ideaForge	Police, disaster management, surveillance
Q6 V2 UAV	ideaForge	Inspection and mapping
A200 UAV	Asteria Aerospace	Security and industrial inspection
Genie UAV	Asteria Aerospace	Infrastructure monitoring

3. Agricultural Drones

Drone	Company	Purpose
Garuda Kisan Drone	Garuda Aerospace	Crop spraying
Kisan Drone	IoTechWorld Avigation	Precision agriculture
Agribot Drone	General Aeronautics	Precision farming

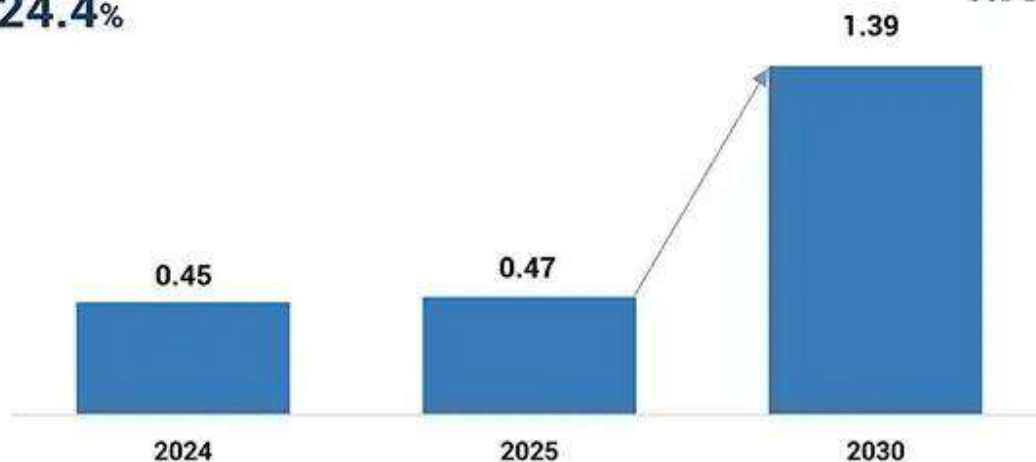


India Drone Market Growth

CAGR (2025-2030)

24.4%

MARKET SIZE
USD BN



MARKET SNAPSHOT



Market Size in 2024 (Value)	USD 0.45 BN
Market Forecast in 2030 (Value)	USD 1.39 BN
CAGR	24.4%
Years Considered	2021-2030
Base Year	2024
Forecast Period	2025-2030
Unit Considered	Value (USD MN), Volume (Units)
Market Size in 2024 (Value)	USD 0.45 BN

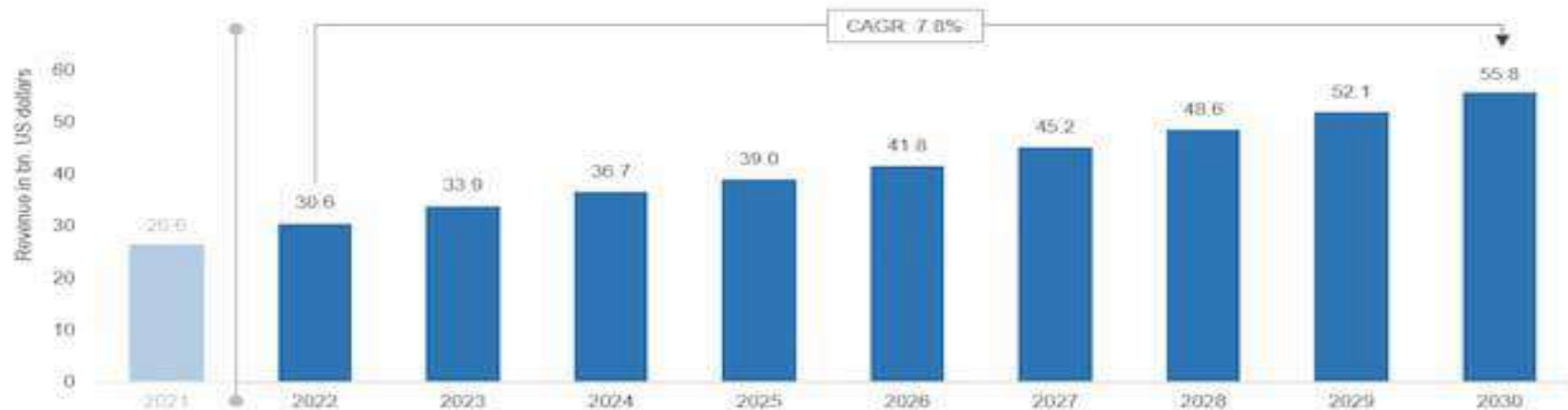
Global Drone Market Growth

DRONE INDUSTRY INSIGHTS

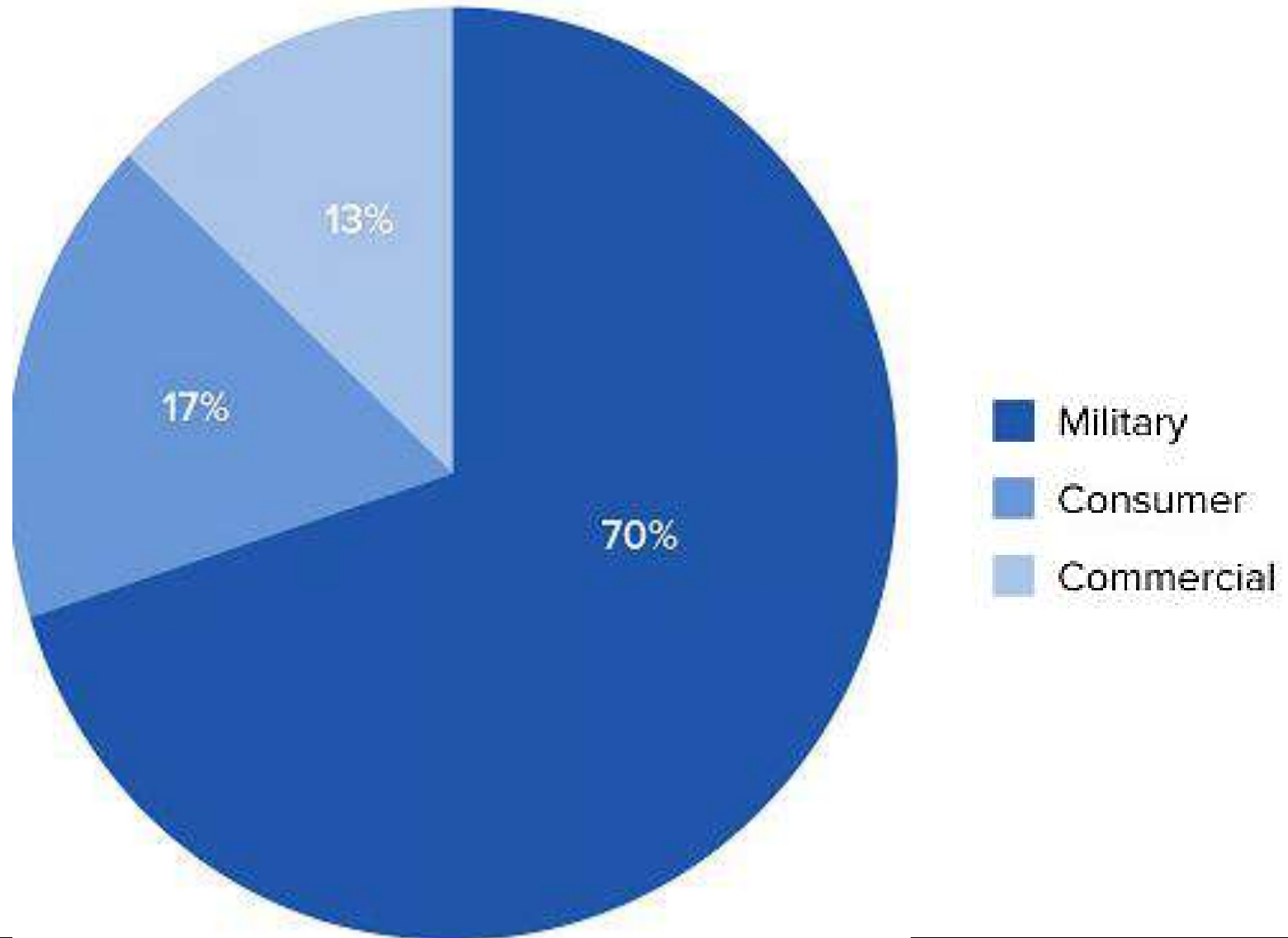
DRONE MARKET GROWTH BY REGION



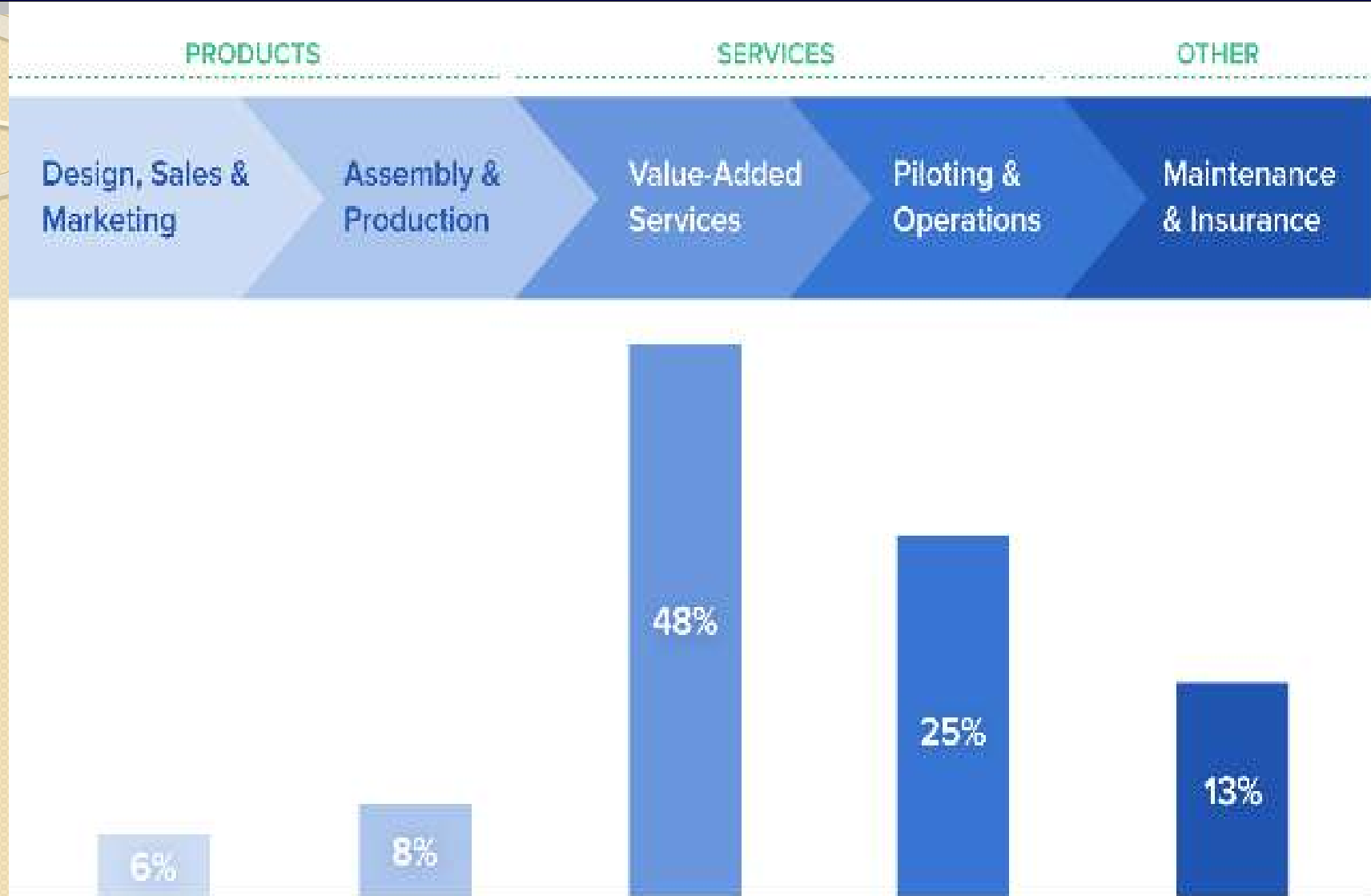
TOTAL DRONE MARKET 2022-2030



Share of Global Drone market by use CASE



Revenue Areas



Reusability Vs Consumable

1. Reusable Drones

Reusable drones are the standard for both consumer hobbyists and commercial operators. They prioritize high-quality sensors, flight time, and durability.

- **Consumer/Hobbyist:** Used for aerial photography, vlogging, and recreation
- **Commercial/Industrial:** Used for agriculture (spraying crops), search and rescue, infrastructure inspection, and package delivery.

2. Consumable (Expendable) Drones

Consumable or expendable unscrewed aerial systems (UAS) are single-use platforms designed to be destroyed or abandoned after completing a single high-risk mission.

- **Military Application:** Used as loitering munitions (kamikaze drones) or as disposable electronic warfare decoys intended to overwhelm enemy defenses.

No of FPV DRONES UKRAINE/Russia PRODUCES MONTHLY

Ukraine's Production

- **Monthly Volume:** Roughly 100,000 units are produced monthly by state and private defense manufacturers.
- **Total Output Goals:** Ukraine aims to produce millions of drones annually, focusing on FPVs (First Person Views) and specialized systems like fiber-optic and interceptor drones.
- **Design:** Most Ukrainian FPV drones cost between \$300 and \$400 to build, acting as a low-cost,

Russia's Production Details

- **Monthly Volume:** Approximately 600,000 units are produced monthly, or about 20,000 per day.
- **Total Output Goals:** Russian state plans aim to manufacture over 7 million FPV drones annually.
- **Design:** Russia focuses on rapid mass-manufacturing, with newer models using fiber-optic cables to evade electronic jamming in the field.

Drones are key in Ukraine's fight against Russia



India MILITARY DRONE MARKET SIZE OUTLOOK (2024-2030)

India Military Drone Market

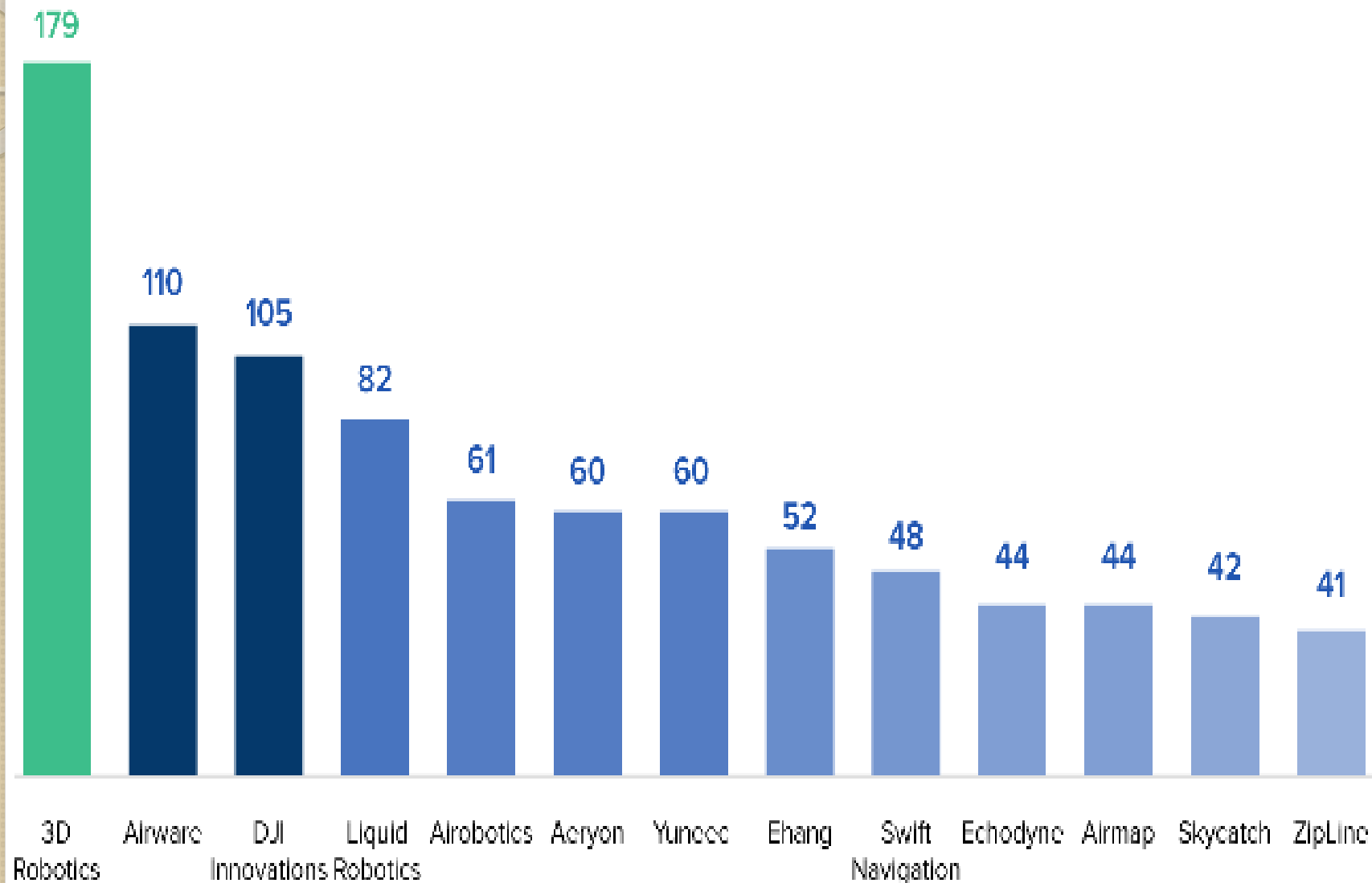
CAGR 17.5%



Market Size in USD

Source: P&S Intelligence

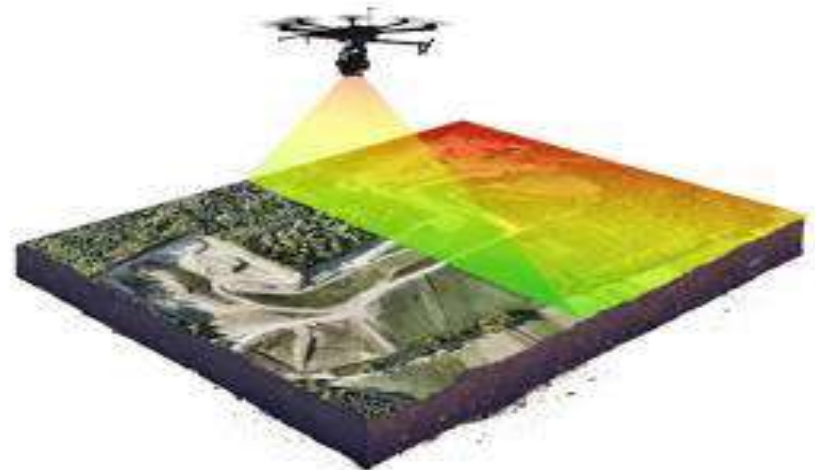
Most Well Funded Startups (billions)



The future of AI and Drones

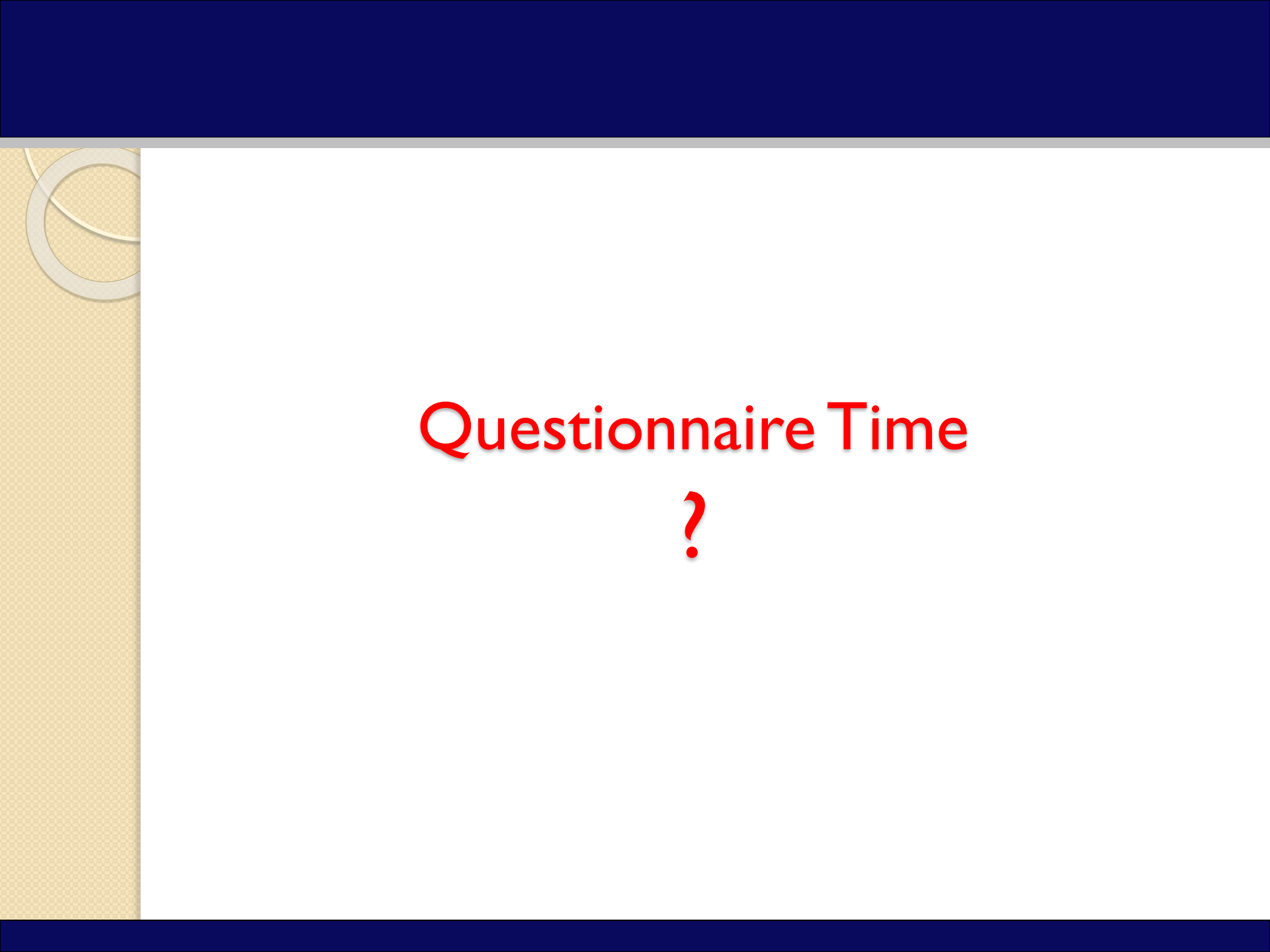
What's Next?

- Integration with LiDAR (Light Detection and Ranging), 5G for enhanced capabilities.
- Expanding to disaster response, environmental monitoring, planetary exploration.
- Addressing ethical considerations (privacy, security).



Conclusion

- AI is revolutionizing UAV capabilities.
- Vast potential for various industries.
- Battery limitations, payload constraints and adverse weather conditions continue to challenge drone development.
- Emerging technologies, like drone swarms, Generative AI, Explainable AI (XAI), Federated Learning, Digital Twins, and 6G Networks will shape the future of intelligent drone.
- Exciting future with endless possibilities
- What possibilities excite you?



Questionnaire Time
?

**Thank
You**

