Intro to Small Unmanned Aircraft Systems & Recreational Drones

HAWKEYE COMMUNITY COLLEGE

Business and Community Education

"If you give me a good grade, I'll give you a good evaluation!"

Mondays & Thursdays

March 31st to April 10th.

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BLACK HAWK R/C PILOTS

AMA Chartered Club #792
Cedar Falls, IA

AMA®
ACADEMY OF
MODEL AERONAUTICS

Class Introduction

- What is your Name?
- Do you own a drone?
- What do you want to get out of this class?
- Anything you want to share with the class?

Class Objectives
By the end of this class, you will know:

How to register as a Recreational Drone Pilot with the FAA	How to pass The Recreational UAS Safety Test	Where you can and cannot fly
The FAA Rules for drone operation	What you can do with a drone	What to look for when buying a drone
What's on the Part 107 commercial drone pilot test	FAA Airspace	Drone Photography

Which ones fit the FAA definition of a Drone?

What is a Drone?

A drone is an aircraft without a human pilot on board. The FAA calls them small Unmanned Aircraft Systems (sUAS) which includes:

1) Unmanned aircraft or drone
2) Ground-based control or transmitter
3) System of communication between the two

Drones can operate with various degrees of autonomy from full remote control by a human operator to autonomously by an onboard computer.

What is a Drone?

The following terms have been used to describe a drone:

- sUAS (small Unmanned Aircraft System)
- Quadcopter, Multi-Copter, Drone
- Model Aircraft, R/C Aircraft, R/C Airplane, R/C Helicopter
- Remotely Piloted Vehicle (RPV)
- Remotely Piloted Aircraft (RPA)
- Remotely Operated Aircraft (ROA)

Types of R/C Drones

- **Fixed Wing** – model airplane
- **Multi-Rotor** – quadcopter or multi-copter
- **Rotary Wing** – helicopter

What can you do with a Drone?

Recreational drone activities

- Aerial Photography – Photos & Videos
  - Scenery & Sunsets
  - Vacation Photos
  - Home Movies
  - Social Media – Facebook, YouTube, WhatsApp, Instagram, TikTok, Snapchat, Pinterest & Reddit
  - Selfies
  - Outdoor Sports – hiking, camping, cycling, canoeing, kayaking, rafting, rock climbing, running, sailing, skiing, sky diving, surfing.
- Fly for Fun
- Technical Challenge
- FPV (First Person View) Flying
- Drone Racing

What can you do with a Drone?

Commercial drone activities

- Education & Research
- Aerial Photography
  - Weddings
  - Video & Movies
  - Sports Filming
- Environmental Studies
  - 3D Mapping & Modeling of Surface Topography
- Real Estate Sales
  - Photographs
  - Land Surveys
- Marketing
  - Aerial Advertising
- Construction
  - Civil Engineering
  - Aerial Inspection of Bridges, Buildings, Windmills
  - Mining Exploration
  - Power Line Inspection
  - Oil & Gas Surveys & Inspections
- Precision Agricultural
  - Seeding & Fertilizer
  - Monitor Crop Conditions
- News & Information

What can you do with a Drone?

Public Safety Activities

Police, Fire & First Responders

Drone as First Responder (DFR)

- Search & Rescue
- Thermal Imaging

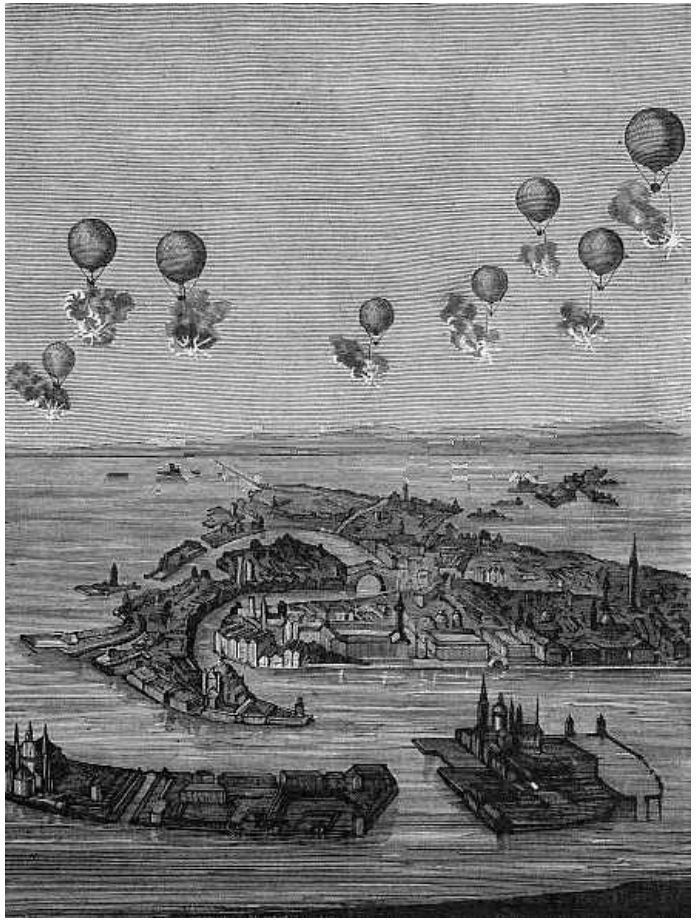
Real-Time Crime Center (RTCC)

- Surveillance
- Traffic Flow

Government

- Street Mapping
- GIS Surveying (Geographic Information System)

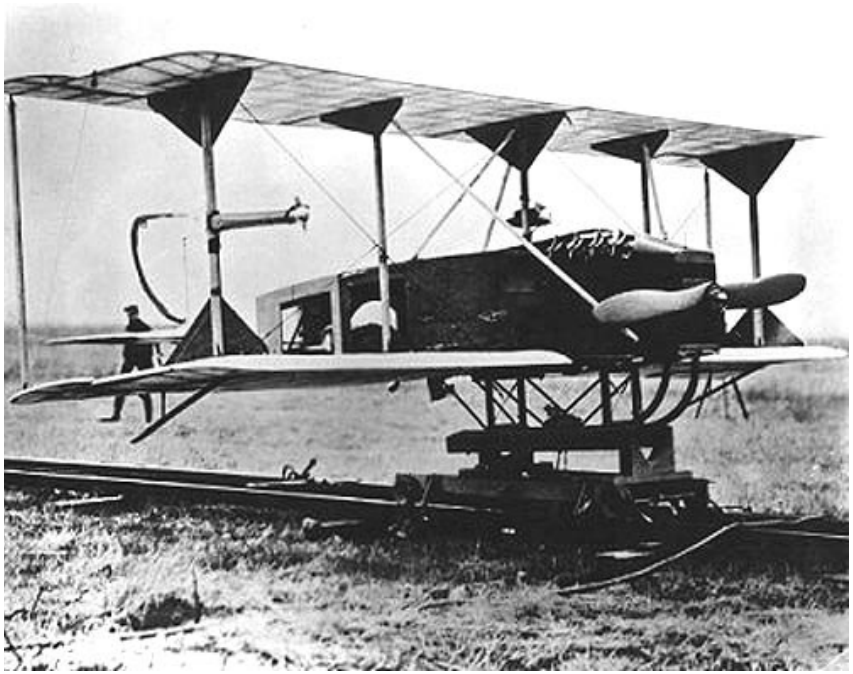
History of Drones



The Republic of San Marco was formed after a revolt in Venice against Austrian rule in March 1848. The Austrians eventually besieged Venice, leading to starvation and outbreaks of cholera in the city. During this siege, they launched the first air raids in history, by unmanned balloons which floated over Venice carrying bombs.

History of Drones

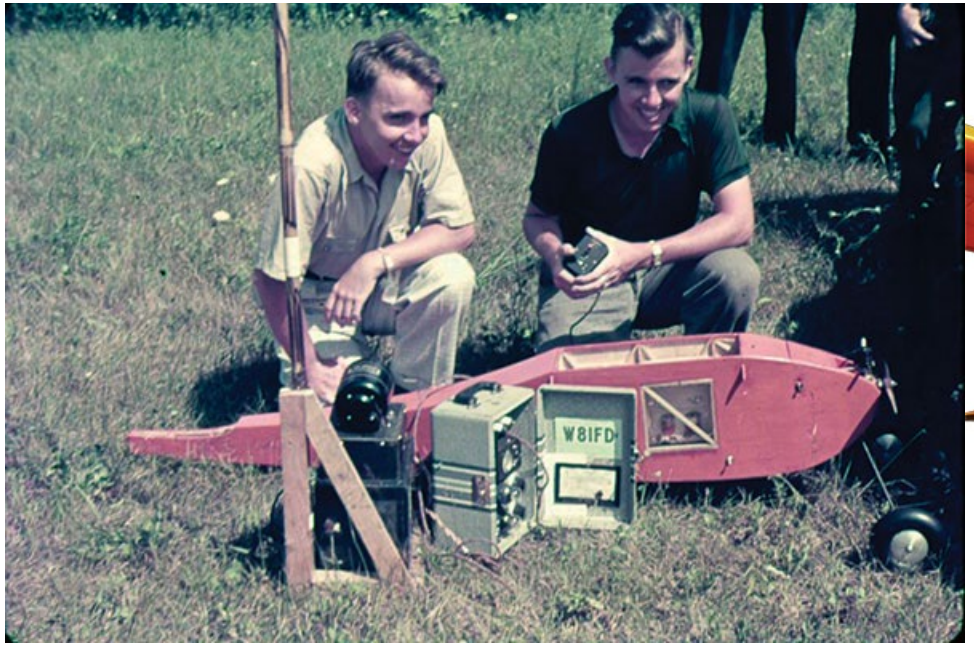
World War I



Hewitt-Sperry Automatic Airplane

Kettering Bug

First Radio Controlled Model Aircraft



Walt and Bill Good with the Guff (1938)

Radio Controlled Target Drones

OQ-3 Radioplane Target Drones built during WWII

MQ-1 “Predator” drone

July 1995 – Enters service for the USAF – Cost $4,030,000

Drone Swarms

First “Toy” Drone

The radio controlled Parrot AR Drone was revealed at the International CES 2010 in Las Vegas. Price $359.

DJI Phantom I

2013 – First ready-to-fly Personal Drone – Price $679
(Camera not included)

DJI Phantom 4

2016 – AI and integrated camera allowed it to avoid obstacles instead of just following a GPS signal – It could autonomously follow people and animals – Price $1399

Types of Drones

Toy Drones – inexpensive

Micro Drones – small size – fly indoors

Hobby or DIY Drones – wide variety in cost and features

Racing Drone – fly fast indoors or outdoors

Photo Drone – high quality camera

Professional & Special Purpose Drones – large, $2000 and up

Toy Drones

- Most are sold in retail stores
- $20 to $250
- Built in China
- Usually not a “brand name” product
- No service and limited replacement parts
- FAA registration usually not needed

Micro Drones
aka “Tiny Whoop”

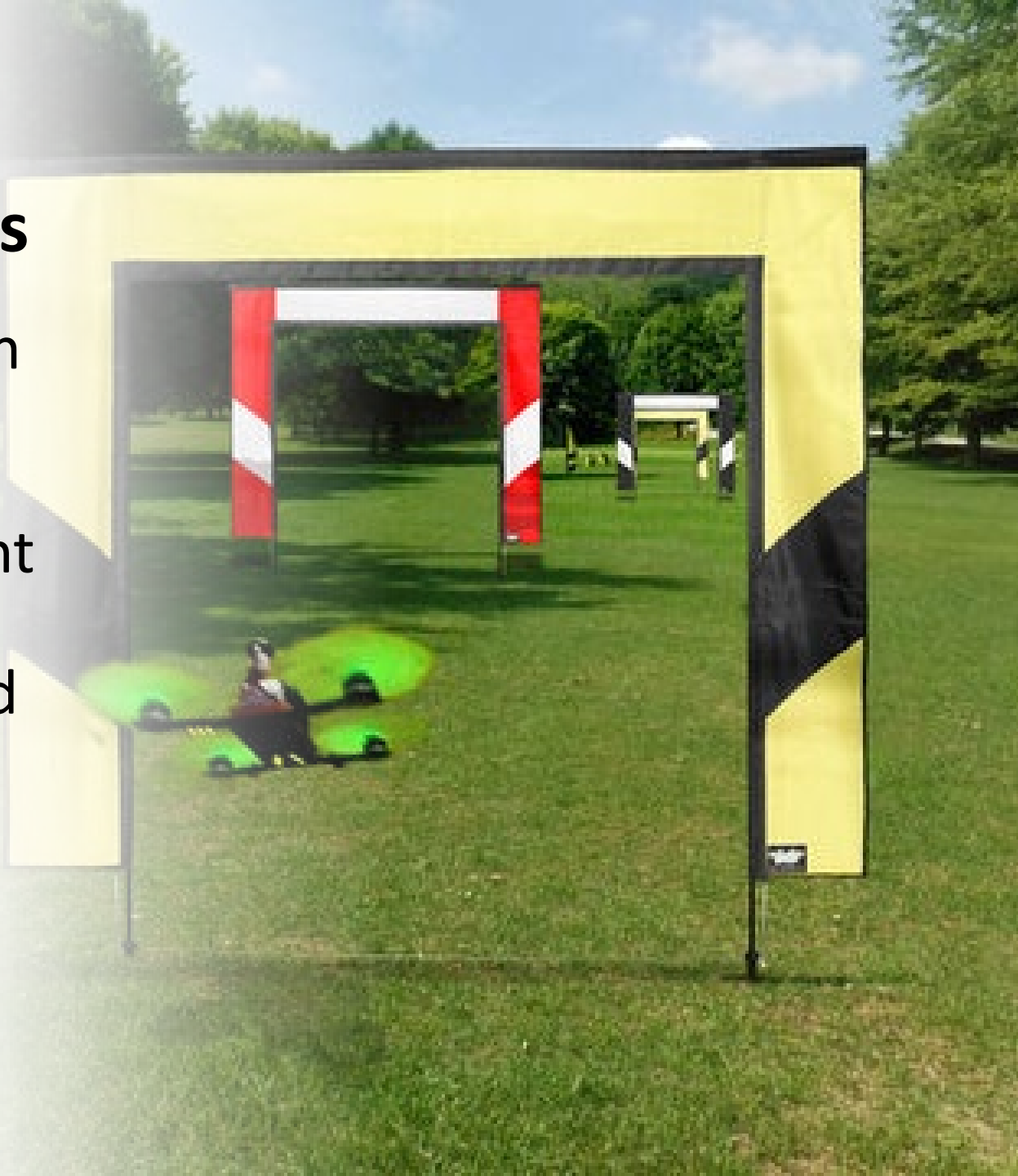
- FAA registration not required
- 5 Minute Flight Times
- Camera is Optional
- Fly Indoors or in Calm Wind Outside
- Too Light to Cause Damage
- Indoor Racing

Hobby or DIY Drones

- FAA registration usually required
- Buy or 3D Print parts
- Buy motors, controller, batteries & camera
- Only limited by imaginat and budget
- Extensive knowledge required
- Must comply with applica FAA Rules

Racing Drones

- FAA registration required for outdoor racing
- 10 Minute Flight Times
- Includes a Fixed Camera & Goggles – First Person View (FPV)
- Fly in all wind conditions



Photography Drones

- $1000 to $2500 & up
- FAA registration required
- 20+ Minute Flight Times
- High-Quality Camera
- Fly Outside on “Breezy Days”
- Advanced Features & GPS

Professional Drones

- Cost – $2,000 & up
- FAA registration required
- 30+ Minute Flight Times
- Heavy Payloads
- Redundancy with 8 Rotors
- Fly Outside even on windy days
- Advanced Features & Highly Accurate GPS
- May use a Ground Station

Agricultural Drones

Aeroseeder is based at Elmwood Farm in Garnavillo Iowa. U50 model has 14.5-gallon liquid or 77 pounds dry capacity – 40 acres/hour. 80 pounds empty takeoff weight.

Drone, Spreader, 2 Chargers and 5 Batteries is $25,270

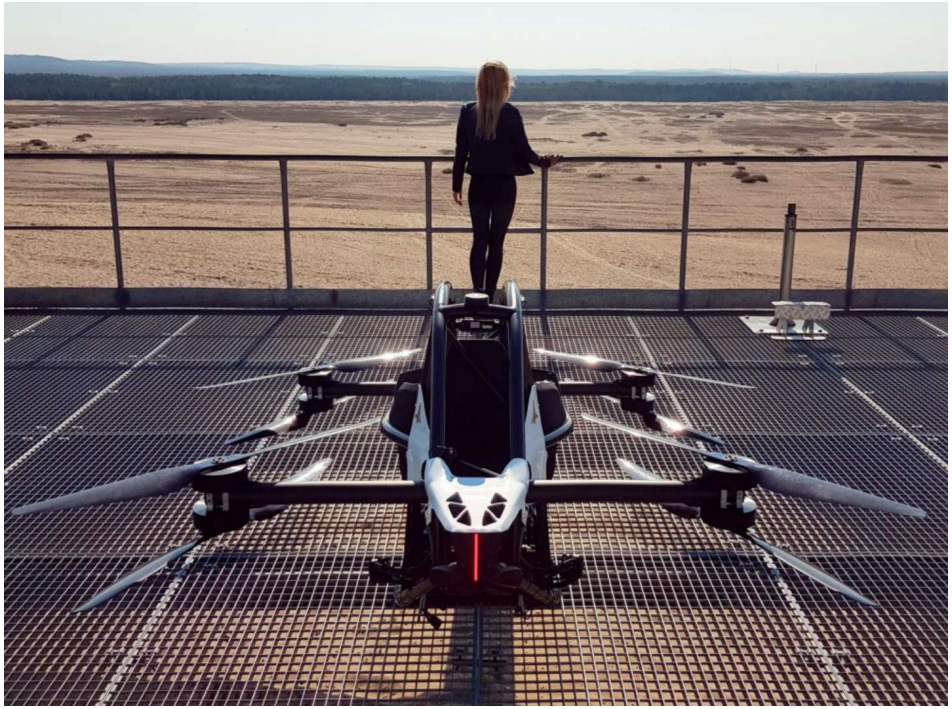
Agricultural Drones

Biosphere is based Dyersville Iowa. DJI Agras T40 model has 14.5-gallon liquid or 88 pounds dry capacity. 110 pounds empty takeoff weight.

Drone, Spreader, 1 Chargers and 1 Battery is $16,999

*Payloads decrease 7 pounds for every 1000 feet altitude increase.

Personal Transport Drones



Jetson ONE - $128,000 – 477 units delivered or on order – taking orders for 2027 delivery

Maximum flight time – 20 minutes

Maximum pilot weight – 210 pounds

Personal Transport Drones

SkyDrive ($1.5M)

Production in 2026

Partnership with Suzuki Motors

Joby Aviation

Consumer Drone Market Today

The market is rapidly changing driven by technological and regulatory change

Drone Market Today

DJI has about 80% market share in the USA

DJI Consumer Drones

- Flip
- Mini
- Air
- Mavic
- Avata
- FPV
- Phantom

DJI Drone Lineup

Camera

- Flip
- Mini 3
- Mini 4 Pro
- Air 3S
- Mavic 3 Pro

Immersive flight

- FPV
- Avata
- Avata 2

Commercial

- Enterprise
- Cinematic
- Agriculture
- Delivery

DJI Flip

- **Flip** – newest model – $439

weighs less than 249 grams (0.55 lbs.)

31-minute maximum flight time

Maximum range – 8 miles

DJI Mini

- **Mini 2 SE** – 6.2-mile range – $280
- **Mini 4K** – 6.2-mile range – $300
- **Mini 3** – 3.7-mile range – $419
- **Mini 4 Pro** – 12.5-mile range – improved camera – $759

All Minis weigh 249 grams (0.55 lbs.)

*Optional extended flight time battery or propeller guards increase the weight

DJI AIR

Air 3S – 12-mile range – 724 grams (1.6 lbs.) – Upgraded Dual camera – $1099

Air 3 – 12-mile range – 720 grams (1.6 lbs.) – Dual camera – $1099

DJI Mavic

Mavic 3 – 9-mile range – 895 grams (2 lbs.) – Hasselblad camera – $2049

DJI Avata

Avata 2 – New Model – 410 grams (0.9 lbs) – 6.2-mile range – includes goggles and motion controller – $1000

DJI FPV

FPV – designed for drone racing. – combo package includes everything you need: the drone, batteries, flight controller, goggles, cables and spare parts – 795 grams (1.8 lbs.) –

Price $999

DJI Phantom

Phantom 4 Pro V2.0 – for professional or enterprise users – 6.2-mile range – 1375 grams (3 lbs.) – $1599

Phantom 4 Pro+ V2.0 – enhancements including improved resolution for on-controller live-view streaming, enhanced connectivity – $2049

DJI Phantom Consumer Drones

- Phantom 1
- Phantom FC40
- Phantom 2
- Phantom 2 Vision
- Phantom 2 Vision+
- Phantom 3
- Phantom 3 Advanced
- Phantom 3 Pro
- Phantom 3 SE
- Phantom 4K
- Phantom 4
- Phantom 4 Advanced
- Phantom 4 Pro
- **Phantom 4 Pro V2.0**
- **Phantom 4 Pro+ V2.0**

Professional DJI Drones

- Inspire ($8000)
- Matrice ($7000)
- Phantom 4 RTK ($10,500)
- Agras T30 ($15,999)
- Terra ($29,000)

DJI FlyCart 30

Weight – 143# with two batteries plus 66# cargo
Max Flight Distance – 10 miles (66# cargo, dual battery mode) and 5 miles (88# cargo, single battery mode)
Price – $42,000

DJI News

Frank Wang is founder and CEO of DJI. Wang founded DJI in 2006 and ran it out of his dorm room at Hong Kong University of Science & Technology.

DJI is headquartered in Shenzhen, China.

DJI Cybersecurity Concerns

The US Military has banned all purchases of Chinese manufactured drones due to cybersecurity concerns.

A report issued by the Pentagon said it didn't find any malicious code when it analyzed DJI drones.

The Department of Homeland Security ran tests on the DJI Mavic Pro and Matrice 600 Pro and didn't find evidence of data being sent overseas.

In 2020, the U.S. Treasury Department banned Americans from trading public securities in eight Chinese technology firms including DJI because of their alleged involvement in surveillance of Uyghur Muslims in the People's Republic.

The Commerce Department placed DJI on the "entity" list in 2020. This barred U.S. companies from exporting products to DJI, which has been deemed a national security threat by the Defense Department.

As of March 31, 2025, there is no ban on DJI drones in the United States, though there are ongoing legislative efforts and potential future restrictions.

The "Countering CCP Drones Act" (also known as the "DJI Ban Bill"), sought to ban DJI drone use of US communication infrastructure. It was not included in the 2025 National Defense Authorization Act (NDAA).

Currently there's a 10% tariff on all Chinese imports to the USA

DJI News

"All DJI products are designed for civilian purposes and cannot meet the requirements of military specifications. We do not support applications for military purposes." – DJI statement

However, DJI drones have been used by both side in the Ukrainian conflict.

Other Drone Makers

There are other drone manufacturers

No one has the variety that DJI offers

DJI tends to set the market price

Skydio and Parrot exited the consumer drone market in 2023.

Drone News

- Amazon, Alphabet (Wing), Intel Corp, AT&T and Uber are developing drones inhouse.
- Amazon and Google have received FAA permission to conduct limited drone deliveries
- Amazon “Prime Air” drone can carry up to a 5-pound payload

FAA Registered Drone Pilots

As of March 1, 2025

- 1,024,862 recreational sUAS pilots
- 438,673 commercial sUAS pilots (there were 160,000 in 2019)
- 823,000 drones were sold in the USA in 2023

US Drone Pilot Income

- 70% earn less than $50,000 per year
- 13% earn between $50,000 to $100,000 per year
- 17% earn more than $100,000 per year
- Hourly rates range from $150 to $200 per hour
- Drone mapping specialists earn more than general drone service providers

The Future

- **Recreational Drone** sales have plateaued
- **Commercial Drone** sales are still growing
- **Top markets** are Photography, Surveying, Construction, Agriculture, Emergency Response & Electrical Energy
- **More Regulation** – Public Distrust & Privacy
- **Beyond Visual Line of Sight** (BVLOS) rules are under development

You Are Responsible

The drone pilot is ultimately responsible for all aspects of the flight, including where it flies, how high it flies, and that all rules and regulations are followed.


Any
Questions