Intro to Small Unmanned Aircraft Systems & Recreational Drones

HAWKEYE COMMUNITY COLLEGE

Business and Community Education

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Mondays & Thursdays

March 2nd to 12th.

Neal Leeper

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BLACK HAWK R/C PILOTS

AMA Chartered Club #792
Cedar Falls, IA

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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 of these fit the FAA definition of a Drone?

What is a Drone?

A drone is an aircraft that operates without a human pilot on board. The FAA refers to these as:

Unmanned Aircraft Systems (UAS), or

small Unmanned Aircraft Systems (sUAS)

which consist of:

- *The unmanned aircraft or drone*
- *A ground-based controller or transmitter*
- *The communication system linking the two*

Drones can function with varying levels of autonomy, ranging from complete remote control by a human operator to fully autonomous operation through an onboard computer.

What is a Drone?

The following terms have also been used to describe drones:

- Quadcopter, Multi-Copter
- 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 Drones

- **Fixed Wing** – airplanes or 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)

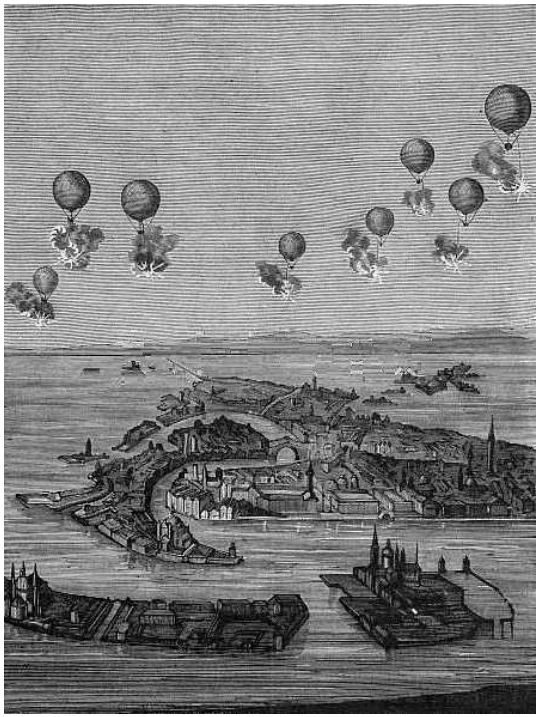
- Search & Rescue
- Thermal Imaging

Real-Time Crime Center (RTCC)

- Surveillance
- Traffic Flow

Government

- Street Mapping
- GIS Surveying (Geographic Information System)

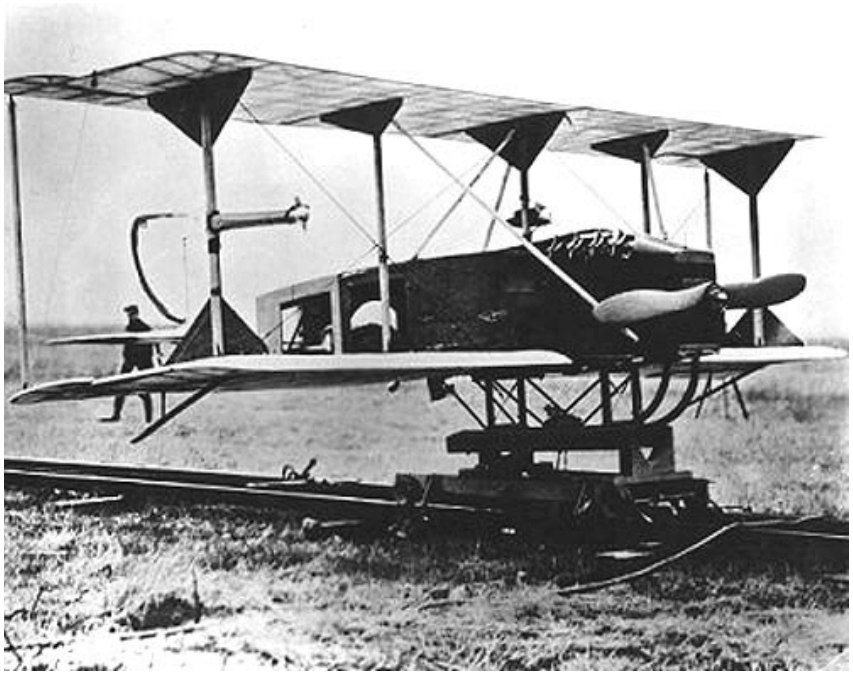


History of Drones

In 1848, the city of Venice revolted against Austrian domination. The Austrians besieged the city by sea. During the siege, they conducted the first recorded air raids in history, using unmanned balloons to drop bombs over Venice.

History of Drones

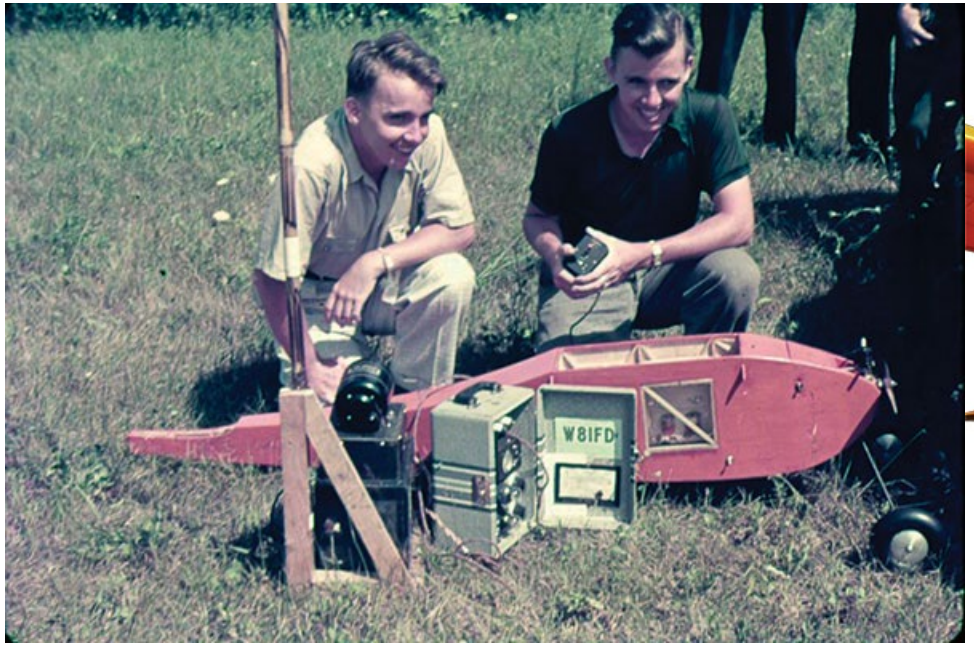
World War I



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

Varities 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
- Most are from China
- Usually not a “brand name” product
- No service and limited replacement parts
- FAA registration usually not needed

Micro Drones
aka “Tiny Whoop”

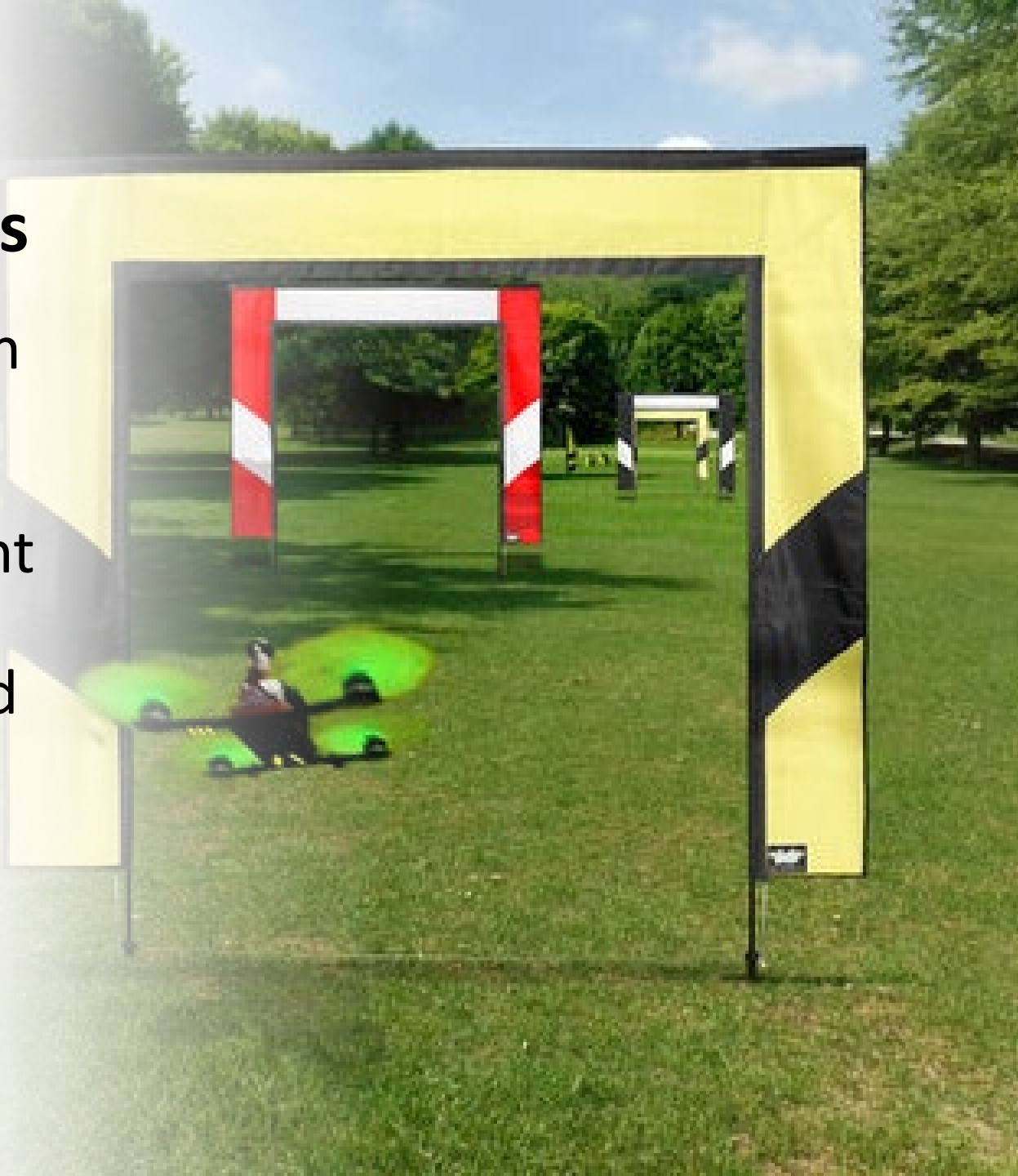
- FAA registration not required
- 5 Minute Flight Times
- Camera is Optional
- Fly Indoors or in Calm Wind Outside
- Too Light to Cause Damage
- Indoor Racing

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

- $1500 & up
- FAA registration required
- 20+ Minute Flight Times
- High-Quality Camera
- Fly Outside on “Breezy Days”
- Advanced Features & GPS

Professional Drones

- Cost – $3,000 & 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

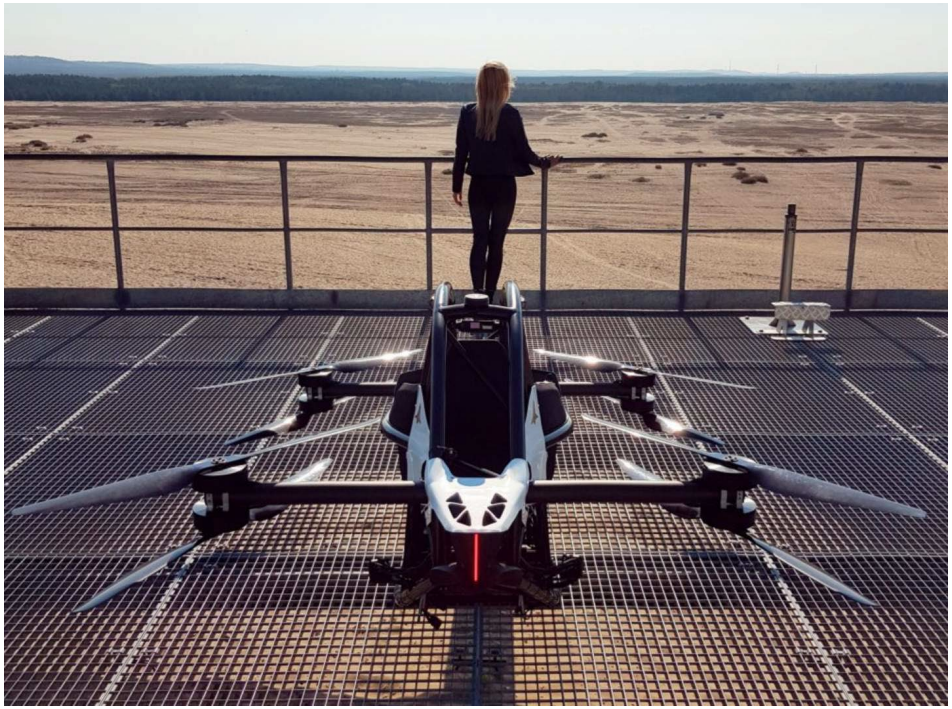
Agricultural Drones

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

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

Immersive flight

- FPV
- Avata
- Avata 2

Commercial

- Enterprise
- Cinematic
- Agriculture
- Delivery

DJI NEO

NEO – newest model – $199

Recommended for VLOG

weighs 135 grams (0.29 lbs.)

12 to 30-minute flight time

Maximum range – 4.3 miles

DJI Flip

Flip – $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
- **Mini 5 Pro**** – $1200

Minis weigh 249 grams (0.55 lbs.)

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

** The Mini 5 Pro reportedly weights 251 grams

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 Classic – 9-mile range – 958 grams (2.11 lbs.) – Hasselblad camera – $1275

Mavic 3 Pro Cine– Telephoto lens – 963 grams (2.12 lbs.) – $2199

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 (No longer in production)

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

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

DJI Phantom (2013 – 2025)

- 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

Specialized DJI Drones

- **Video** – Inspire 3 ($16,499)
- **Enterprise** – Matrice & Mavic 3
- **Agriculture** – Agras T30 ($15,999)
- **Mission Planning** – Terra ($29,000) & Mavic 3M ($5800)

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.

“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.

Chinese Drone Ban

The **2024 National Defense Authorization Act** (NDAA) requires a US national security agency to complete a formal security review of Chinese drones by December 23, 2025. If no agency does the audit, Chinese drones will be automatically added to the **FCC Covered List**, which would effectively ban new drones from being imported or sold in the US. The ban could cause problems for firmware updates, warranty and getting replacement parts.

FCC Drone Ban

This ban doesn't just apply to drones. According to the Public Notice released by the FCC, if a drone uses Chinese-made parts, it can be scrutinized by the FCC and blocked from being released in the USA. These parts can be anything: batteries, propellers, cameras, sensors and electronics.

The FCC can also retroactively ban devices that were previously approved for sale if their manufacturers are later added to the FCC's Covered List.

What's Happened

Drones added to the FCC Covered List prior to December 23, 2025, can still be legally flown in the USA.

Drones that were registered with and authorized by the FCC before the ban, can still be imported and sold in the American market.

The FCC has also exempted drones specifically designed for first responders, government agencies and task forces, search and rescue teams, and surveillance teams until January 1, 2027.

What's Happened

On January 21, 2026, the FCC Office of Engineering and Technology (OET) issued a statement that it had reversed a decision to stop existing Chinese-made drones from receiving critical software and firmware updates.

Chinese-made drones — including those from DJI — will continue receiving firmware/software updates as well as security patches, at least until January 1, 2027.

What's Happened

DJI has filed a lawsuit against the FAA, alleging that the FAA has violated their 5th Amendment Rights to Due Process.

The FCC has exempted other foreign-made drones and critical components from Europe, Japan (Sony and Panasonic) and South Korea (Samsung). The FCC hasn't exempted any drones or drone parts made in China.

DJI requested that the US government audit its devices multiple times before the FAA issued the import ban.

What May Happen

If the FCC acts to “delist” DJI drones, it will not affect their operation on the 2.4 GHz and 5.8 GHZ frequencies. It cannot remotely disable Chinese drones, nor can it block the operating frequencies.

Users my not be able to obtain air clearances or waivers for DJI drones, which will limit their commercial use.

What May Happen

DJI may sell their drones under different brand names. The National Defense Authorization Act ban listed Chinese companies by name, so “new” companies are not immediately banned.

In 2025, Skyrover was founded in Hong Kong by a team of engineers from DJI. Skyrover models appear to be identical to some DJI models.

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 July 2025

- 1,121,891 recreational sUAS pilots
- 400,000+ recreational drones
- 460,375 commercial sUAS pilots (there were 160,000 in 2019)
- 433,407 commercial drones

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

Just flying a drone is not enough

Specialized Skills

- Mapping
- Thermography
- 3D Modeling
- Data Analysis
- Editing

A Drone is just a Tool!

Industries

- Real Estate & Events – Low Rates, Easy Entry
- Construction & Infrastructure – Recurring, Higher Contracts
- Agriculture – Multispectral Imaging
- Film & TV – High Risk, High Reward
- Utilities & Energy – High Pay, High Responsibility

Deliver insight to decision makers

The Future

- **Recreational Drone** sales have plateaued
- **Commercial Drone** sales are 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