

DRONE REGULATIONS AND SAFETY

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Center of Excellence on Unmanned Aircraft System Safety

Mission Statement

The Center of Excellence on Unmanned Aircraft System Safety provides system-wide expertise, support and training for regulatory compliance, risk management and the safe operation of Unmanned Aircraft Systems, commonly known as drones, across the University of California system.



UNMANNED AIRCRAFT SYSTEM SAFETY

Policy Development

- Compliance with Federal, State, and Local Laws
- Long-term Policy development
 and assessment
- Guidance on local enforcement

Risk Management

- Fleet management for monitoring and assessing UAS usage
- Data collection for safety metric assessments

UAS Operations & Authorizations

- FAA Authorization Services
- Hazard & Risk Identification
 Flight Operation and
 Management Support

DRONES IN AGRICULTURE

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Fertilizer Application Decision Support

Crop Yield Estimation

Crop Health Monitoring

Pest Infestation Mapping

Fire Damage Assessment

Irrigation/Canal Leak Detection and Localization

Soil Moisture

Mapping weed pest populations

Forage Utilization for Livestock

3D Landscape reconstruction Soil Erosion Monitoring Seasonal Water Feature Monitoring Soil Subsidence Soil Salinity Aerobiological Sampling Autonomous Spraying for large plots Intelligent Spraying to Counter Wind Drift





Multi-rotor Copters

- Generally 20-25 minute flight time with
- Vertical take off and landing
- Can cover > 50 acres per flight

Fixed-Wing

- Longer flight time (> 40 min)
- Moves faster and can cover 100-200+ acres per flight
- Typically more difficult to fly and more difficult to land

PAYLOADS



<u>Multispectral</u>









APPLICATIONS



Multispectral cameras currently give you the most bang-foryour-buck for agricultural applications. These instruments typically cost between \$740 and \$5500



LiDAR technology is best for complex measurements of tree canopy structures. Previously, LiDAR processing software was an issue, now it is the cost of UAS adapted units, which typically start at around \$55,000.



Thermal imaging is particularly suitable for detection of moisture (including water features, irrigation and even evapotranspiration), fire detection (including intensity) and search and rescue. These units typically start at around \$9000 for digital units (if you intend to use it for mapping, don't get a cheaper analog unit).

APPLICATIONS - WEED DETECTION





APPLICATIONS – CROP HEALTH







APPLICATIONS - IRRIGATION

CJI

ZENMUSE XT

powered by SFLIR





APPLICATIONS - PESTICIDE

Provides more accurately timed treatment without the disturbance of ground-based methods

Reduce human contact with the chemicals, which helps to preserve human health





APPLICATIONS - PESTICIDE

Small size allows for low altitude, low speed flights reducing spray drift

Larger droplet size drift less

Spray drift is a significant concern for droplet sizes less than 200 microns and below

Droplets below 50 microns tend to remain suspended in the air rather than drift



DRONE REGULATIONS

THE BIG DRONE RULE

Don't do anything stupid or reckless









DRONE RULES (FAA) - THE OTHER BIG 6

All Drones must be registered -DroneZone

Unless under 0.55 lbs

You must have a Drone License

Unless your specific flight is exempt

You may need authorization near airports

- Class G ok
- Controlled Airspace will need approval

No flying beyond visual line of sight

- You must be able to see and assess risk at all times during flight
- No flying above 400 ft AGL
- With some exceptions
- No flying over people
- Unless with certified drones

DRONE REGULATIONS

Neither 107 nor 44807 allow for agricultural operations

> Part 137 Agricultural Aircraft Operations



SUAS REGULATIONS (PART 107)

The pilot must have **remote pilot certificate** with a **small UAS rating**.

No carriage of hazardous materials (§107.36), but other material or items may be carried.

May fly only during daylight and within visual line of sight, or close enough to see the aircraft clearly without additional vision aids.

How to obtain

- Operators must pass an Aeronautical Knowledge Test at an FAA-approved knowledge testing center.
- Knowledge exam is \$150 and is allotted for 2 hours



AGRICULTURAL AIRCRAFT OPERATIONS

Federal Regulations

- 14 CFR 137 Agricultural Aircraft Operations
- Dispensing any economic poison
- Dispensing any other substance intended for plant nourishment, soil treatment, propagation of plant life, or pest control
- Engaging in dispensing activity directly affecting agriculture, horticulture, or forest preservation

*excluding live insects

State Regulations - AB No. 527

In CA, you must have either a Manned Pest Control Aircraft Pilot Certificate, or an Unmanned Pest Control Aircraft Pilot Certificate

3 Types of Unmanned Pest Control Aircraft Pilot Certificate

- UAS Apprentice
- UAS Journeyman
- Vector Control Technician

NAVIGATING THE FEDERAL REGS



NAVIGATING STATE REGS



Manned Pest Control Pilots are eligible for both unmanned and manned applications

DPR requires federal authorization (Aircraft exemption and AAOC, or a Public Agency COA) before applying to take the DPR UAS exam

> https://www.cdpr.ca.gov/docs/ license/pdf/UAS_cert_info.pdf

WHAT DOES THIS MEAN FOR DRONES IN AG?

Drones can be used in Agricultural Operations

- If you're already a Pest Control Aircraft Pilot, this process may be workable
- If you're thinking about expanding into Drone Spraying, the authorization process is a big hill to climb

Drones over 55 lbs

• The authorization process for Drones over 55 lbs is still incredibly slow and difficult

Beyond Visual Line of Sight

 All drones are still required to be within visual line of sight of the operator – limiting for a lot of agricultural operations. New technology and regulations are needed before this is common.

We're still not quite there yet

MY RECOMMENDATIONS

Short Term

Buy a drone to fly for fun or for visual inspections

Don't expect significant returns on your investment

5-10 Years down the road

Keep an eye out for new developments

Data mining and analysis is the future of drone's applicability

THANK YOU



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