



Aerial Intelligence

Improving Construction Inspection While Mitigating Risks

by: Joe Hunn, PE





Joe Hunn, PE

Vice President, Transportation

Pilot: sUAS #XXXXXX22

Drone: DJI Phantom 4 Pro +

Flights: 100+

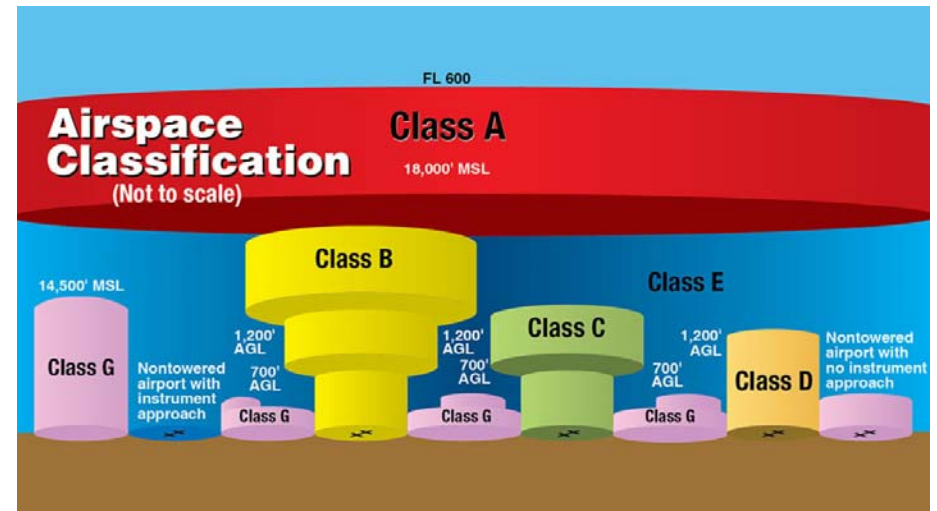
T: 630.724.9730

M: 312.590.7376

E. j.hunn@cotterconsulting.com

sUAS Exam Overview

- FAA study Guides available for free online
- Testing Centers at International Airports
- Requires registrations on IACRA website
- Passing score of 70% on 60 question exam
- Exam Topics:
 - 14 CFR Part 107 Regulations
 - Airspace Classifications
 - Sectional Chart analysis
 - Crew Resource Management
 - Radio Communication procedures
 - Aeronautical Decision-Making & Judgement
 - Airport Operations
 - sUAS loading and performance (weight & weather)
 - Aviation Weather Report reading (METAR & TAF)
 - Emergency/Deviation/Accident Reporting to FAA



FAA Section 333 and 107 Differences

	FAA SECTION 333	FAA SECTION 107
License Requirements	<ul style="list-style-type: none"> Requires Pilot License. 49 C.F.R. §§ 44703 and 44711. \$10,000-\$4,500 Significant Hours of Training. Must demonstrate ability to operate UAS 	<ul style="list-style-type: none"> Requires Merely Pilot Certificate. 60 Item Multiple Choice Test. 2 Hour Test \$150
Medical certificate	<ul style="list-style-type: none"> Requires Medical Certificate Issued by the FAA Certifying Physical and Mental Aptitude. 	<ul style="list-style-type: none"> Requires Self-Prepared Medical Certificate Based upon a Pilot's Self-Assessment of Physical and Mental Well-being.
Number of Persons	<ul style="list-style-type: none"> Requires at least 2 people for all flights/activities. A properly certified pilot and a visual observer. 	<ul style="list-style-type: none"> Requires only certified person as long as the drone remains in line-of-sight. If not, a second person is required.
Times of Flight	<ul style="list-style-type: none"> Flight is permitted during daylight. 	<ul style="list-style-type: none"> Flight is permitted during daylight and extended to twilight hours (dawn and dusk 30 minutes before and after sunrise/set), if the drone is equipped with anti-collision lighting components.
Time to Process Certification	<ul style="list-style-type: none"> Processing certification takes 6 months or more. 	<ul style="list-style-type: none"> Processing certification averages no longer than 2 months.
Drone Aircraft Weight and Altitude	<ul style="list-style-type: none"> The maximum weight of a drone is subject to FAA approval. A drone can be flown up to a maximum altitude of 400 feet. 	<ul style="list-style-type: none"> The maximum weight of a drone is limited to 55 lbs. A drone can be flown up to a maximum altitude of 400 feet unless it is being flown within 400 feet of a structure at which point the drone can fly a maximum of 400 feet above the structure's upper boundary.
Reporting Incidents	<ul style="list-style-type: none"> All flight incidents are expected to be reported to the FAA. 	<ul style="list-style-type: none"> Only flight incidents that have caused serious personal injury or property damage amounting to at least \$500 must be reported to the FAA. Must be reported within 10 days.

DJI Phantom 4 Pro

Cost: \$1,800

Flight Time: 30 minutes

Specs:

- Speed-45 mph
- Height Ceiling- 19,685 ft AGL
- Satellite Positioning System – GPS/GLONASS
- Operating Temp – 32 – 104 degrees F
- Camera – UHD 4K
- Intelligent Flight Modes - 7



DJI Phantom 4 Pro

Common Uses: Aerial Photographs | Progress Photos & Videos | Existing & Final Conditions



DJI Phantom 4 Pro

Common Uses: Value Engineering Proposals



DJI Phantom 4 Pro

Common Uses: Environmental Assessments | Flooding Areas





DJI Phantom 4 Pro

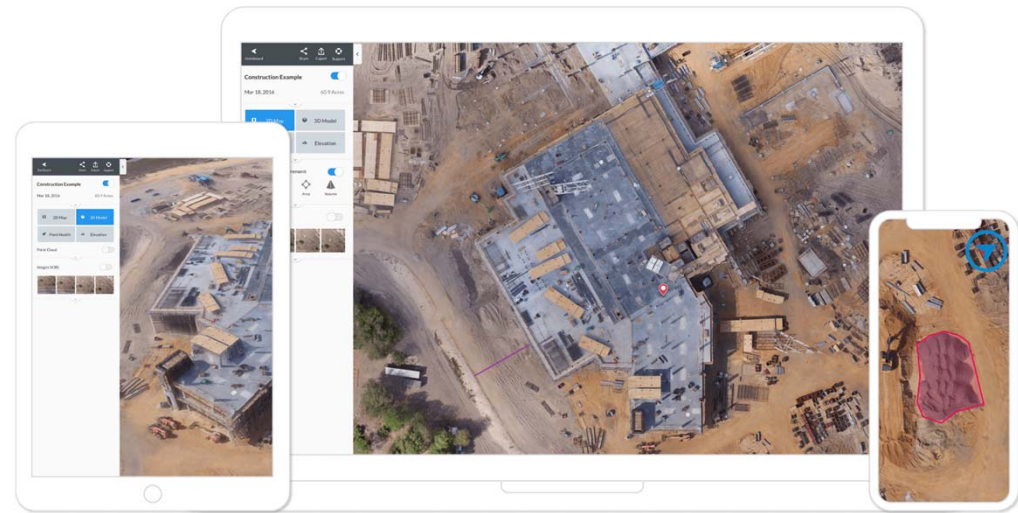
Common Uses: Quantity Measurement

Requires additional software

- DroneDeploy - \$3600/year
- Accuracy to the centimeter
- Length, Area, Volume Calcs
- Topographic Maps



Construction Mapping Package



DJI Phantom 4 Pro

Common Uses: Recruitment



Flyability Elios

Cost: \$25,000

Flight Time: 10 minutes

Specs:

- Collision Resistant – up to 5mph
- Additional Lights – On-Board LEDs
- Camera – HD, Thermal, 130 degree vertical
- Operating Temp – 32 – 122 degrees F





SAFE DRONES
FOR INACCESSIBLE
PLACES



Flyability Elios

Common Uses: Bridge Inspections – Money Savings

Used by Collins Engineers & Minnesota DOT

- Reduced MOT closure needs
- Reduced fall protection needs
- Eliminated aerial Work Platforms, Rope Access Operations, Equipment Rentals
- Eliminated Confined Space certificates
- More accurate yearly inspections

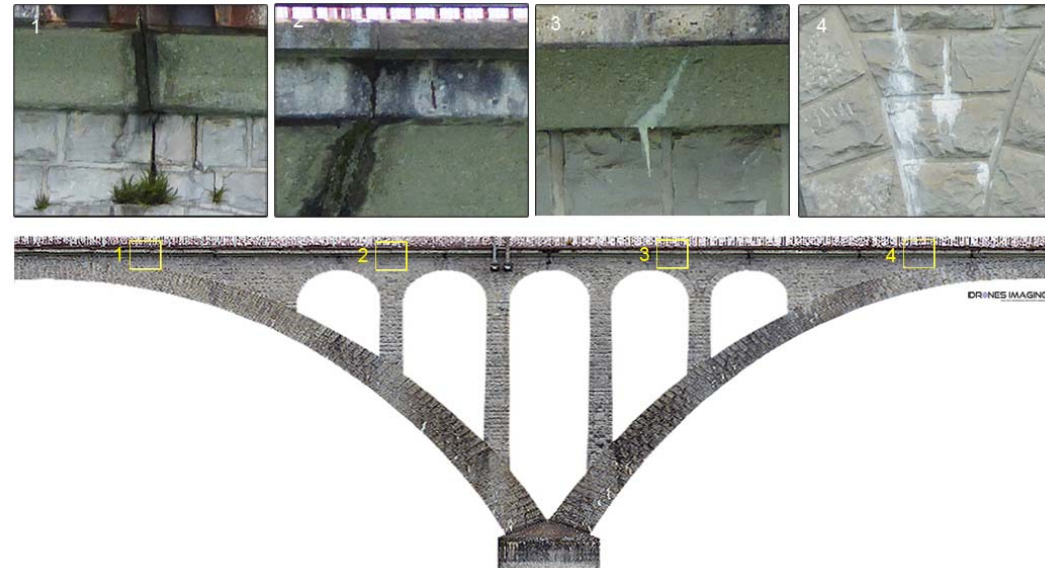


Flyability Elios

Common Uses: Bridge Inspections - Deliverables

Used by Collins Engineers & Minnesota DOT

- Used in conjunction with Pix4D Software
- \$8K Perpetual License/\$3K-\$4K yearly License
- Created accurate Ortho-Mosaic Images of bridges and repair areas
- Required the use of aerial ground control points for slight corrections
- Calculated Load Ratings for Structures
- 0.5 hours of video required 3 hours of data processing





Flyability Elios

Common Uses: Bridge Inspections - Issues

Used by Collins Engineers & Minnesota DOT

- Does not eliminate the need for Certified Bridge Inspectors!
- Notification to adjacent property owners
- New signing for MOT
- New training & operations manuals needed
- Develop and track performance metrics and measures

Intel Falcon 8+

Cost: \$15,000

Accuracy: Millimeter

Common Uses: Used by Michael Baker Int'l in conjunction with Kentucky Transportation Cabinet & Minnesota DOT

- Bridge Inspections
- 3D Modelling



Illinois Drone Laws 2013-2017

The Beginning

- Multi-Jurisdictional Regulations
- Laws Varied Among Municipality, City and Town
- Regulations State Wide Were Specific to local City, Town, Suburb



Illinois Drone Laws 2013-2017

The Beginning

- Multi-Jurisdictional Regulations
 - Elgin – Restriction on Drone Flight
 - South Elgin – Restriction on Drone Flight
 - Schaumburg – Limitations on flight near village property, village right of way or public events
 - Manhattan – Drone size regulation, flight path and time use regulations
 - Evanston – No Drones



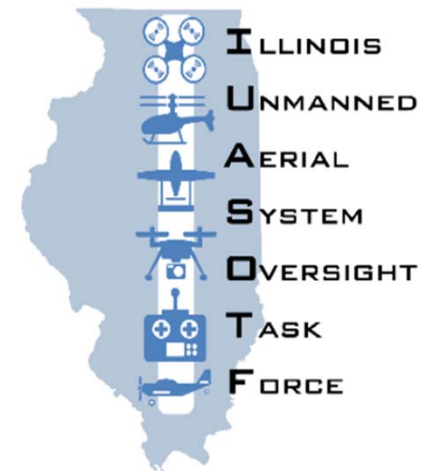
Illinois Drone Laws 2013-2017

August 2015 State Involvement – IDOT Division of Aeronautics Task Force

Illinois Unmanned Aerial System Oversight Task Force

- Established on August 18, 2015 P.A. 99-392; 20 ILCS 5065
- Committee of 23 Vested UAS Stakeholders Appointed by Legislature
 - Provide input for recommendations of laws and rules for the operation and use of drone technology within Illinois,
 - Prepare comprehensive recommendations for the safe and lawful operation of Unmanned Aerial/Aircraft Systems (UAS)
 - Report to the Governor and General Assembly by June 30, 2016

UAS Recommendations Report



Submitted to the Governor and General Assembly
in accordance with 20 ILCS 5065/
June 30, 2016



Task Force established by the Illinois
Unmanned Aerial System Oversight
Task Force Act (Public Act 099-0392;
20 ILCS 5065)

Administrative support provided by
 Illinois Department
of Transportation

Illinois Aeronautics Act

August 3, 2018, Legislative Amendment

Immediately Effective – Provides for Illinois Aeronautics Act to Govern UAS/Drones

Precludes Illinois Municipalities with population of less than 1 million people from enacting “ordinances or resolutions to regulate unmanned aircrafts systems” 620 ILCS 5/42.1(b)

City of Chicago Receives Exemption

- This includes by definition “unmanned aircraft and its associated elements, including communication links and components that control the unmanned aircraft that are required for... operation in airspace system” 620 ILCS 5/42.1(a)
- Intent of legislation to prevent convoluted multi-jurisdictional requirements across state and nullify current local regulations.
- This means all (but for one Illinois municipality) is generally precluded from regulating “unmanned aircrafts systems”

City of Chicago Chapter 10-36 of Municipal Code of Chicago

Amendment of Municipal Code Title 10 – Additional Chapter 10-36

Regulations of Use of Small Unmanned Aircraft In City Airspace

- Created Operating Regulations and Requirements
- Prevents Drones Unless Under Allowed Exceptions
- Exceptions Under 10-36 Include:
 - Hobby/Recreational Use
 - Operations Authorized by the Federal Aviation Administration
 - Operations Authorized by State of Illinois
 - Local City Penalties Violations
 - Seizure – Storage Fines \$20 per day
 - \$500-\$5,000 Per Day/Per Offense
 - Criminal Incarceration - Misdemeanor



Illinois Department of Transportation

Acknowledges Different Legal Authorities Applicable to Drone Use

Three Illinois State Laws and 14 C.F.R. 107

725 ILCS 167/15

- This law loosens regulations around law enforcement's use of UAS during a disaster or public health emergency, and creates regulations for how law enforcement can obtain and use information gathered from a private party/third party use of drones for warrant protocols.

720 ILCS 5/48-3 Formerly 520 ILCS 5/1.2

- This law prohibits anyone from using a drone to interfere with hunters or fisherman.

Public Act 98-0569

- This law allows drones to be used by law enforcement with a warrant to counter a terrorist attack, to prevent harm to life, or to prevent the imminent escape of a suspect.

FAA Regulations 14 C.F.R. 107



IDOT and ISTHA will allow for video/photos of progress, conditions, general informational inspection and information gathering.

They have not approved UAS use for measurement of quantities, volumetric or surveying.

FAA Federal Regulations

Governing Authority 14 C.F.R. § 107

Eligibility to obtain sUAS Pilot Certificate

- 16 years of Age
- Read and Write English Language
- No physical mental conditions interfere with operation
- Issuance of Certificate (valid for 2 yrs)
 - Passing Test Score received
 - Temporary Certificate issued within a week (approx.)



FAA Federal Regulations

Governing Authority 14 C.F.R. § 107

Registration of Drone Required

- Cost Nominal (\$5)
- Required for any commercial use
- Registration Effective for 3 years
- Less than 55 lbs.
- “License plate” required for drone

The top five industries submitting applications include (1) Transportation, (2) Construction, (3) Engineering, (4) Agriculture and (5) Government.



FAA Federal Regulations

Governing Authority 14 C.F.R. 107

Regulations for Use

- At all times the small unmanned aircraft must remain in visual line-of-sight.
- Small unmanned aircraft may not operate over any persons not directly participating in the operation.
- Daylight operations only.
- Must yield right of way to other aircraft.
- Maximum ground speed of 100 mph
- Maximum altitude of 400 feet above ground level.
- Minimum visibility of 3 miles from the control station.
- Operations in controlled airspace are allowed with the required Air Traffic Control permission.
- Cannot operate from a moving land or water-borne vehicle (unless in sparsely populated area)



FAA Federal Regulations

107.39 Operation Over Human Beings

No person may operate a small unmanned aircraft over a human being unless that human being is:

- a) Directly participating in the operation of the small unmanned aircraft; or
- b) Located under a covered structure or inside a stationary vehicle that can provide reasonable protection from a falling small unmanned aircraft.



FAA Federal Regulations

Waivers of Regulations 107.200 and 107.205 & Airspace Authorizations

- a) The FAA may issue a certificate of waiver authorizing a deviation from any regulation specified in 107.205 if ...UAS operation can safely be conducted under the terms of that certificate of waiver.

- b) A request for a certificate of waiver must contain a complete description of the proposed operation ... under the terms of a certificate of waiver.
 - a) May deviate from the regulations of this part to the extent specified in the certificate of waiver;
 - b) Must comply with any conditions or limitations that are specified in the certificate of waiver.

In January 2019, FAA released a Notice of Proposed Rule Making Change to eliminate restrictions for night flight and flight over individuals. A proposed rule change is pending but the legislative process and just begun.

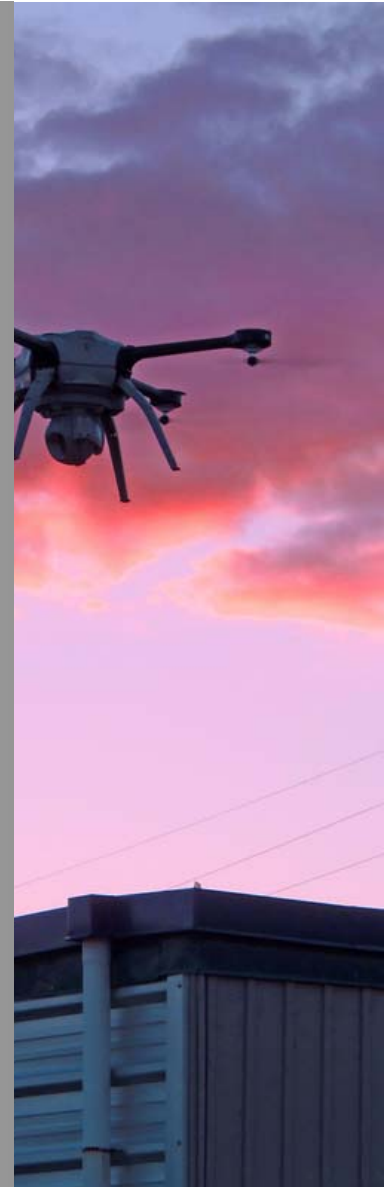
Section 333 is option in lieu of a waiver under §§ 107.200 and 107.205.

Hurdles to Overcome

- Similar Issue to when GPS first came out
 - Lack of trust in the accuracy of measurement and results
 - No approved test comparison of results calculated by drones to GPS/Total Station *per DroneDeploy
- Not approved by ISTHA or IDOT for measurement of pay item quantities
- Initiative from drone manufacturers & software companies needed
- Legal “requirements” have taken extended periods of time and effort to obtain
- Heavy involvement for Public Relations

Conclusion & Recommendations

- Evaluate Insurance Coverage for liability and property
 - Riders/Endorsements
 - Excess Coverage
 - Exclusions
 - Unmanned Aircraft Insurance
- Implement corporate policies and protocols for employees and subcontractors.
- Make Sure Drone is registered with the FAA.



Best Practices

- Use a licensed drone pilot
- Pilot should use a compatible UAS
 - Familiarity of controls and ancillary equipment
 - Experienced
- Agree on a flight plan, scope of services and deliverables
- Make sure Airspace classification and restrictions are known beforehand
- Know your FAA rules and local rules and options
 - (LANCC)
 - Carefully evaluate applications and waivers





“Nobody wants to be the first, but nobody wants to be the last either.”



The information contained herein is for background and presentation purposes and should not be construed and does not constitute legal advice