



Unmanned Aircraft Systems

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Terminology

- Unmanned Aircraft Systems (UAS)
 - Used by FAA and regulatory
- Other
 - Drone
 - Unmanned Aerial Vehicle (UAV)
 - Remote Piloted Vehicle (RPV)
- Quad copter, hexacopter, fixed wing



Uses

- Hobby
 - Photography, racing
- Commercial
 - Insurance, real estate, tower inspections, railroads, agriculture, events
- **Public**
 - Bridge inspections, traffic control, accident investigation, Lidar survey, law enforcement, search and rescue
- Military
 - Des Moines, Boone



Today

- Office of Aviation and UAS
- DJI Phantom 4 quad copter
- UAS at the Iowa DOT
- Regulatory framework
- Integrating UAS into your work unit
- Lessons learned

Office of Aviation role with UAS

- Work closely with FAA
 - Outreach (airports, pilots, law enforcement, state legislative)
 - #1 Goal- Safe integration into the airspace system!
- A resource for guidance on integrating UAS
 - Certification, regulatory assistance, legislative issues
 - Not a drone department, but will test applications
- Using UAS for airport/heliport work in Iowa
 - First in the nation to achieve waivers for operation in ALL airspace!
 - First department to fly unmanned aircraft!



DJI Phantom 4

- Battery life
- GPS/return home
- Precise hovering
- Obstacle avoidance
- Photo/video- 3 axis gimbal
- Live video feed



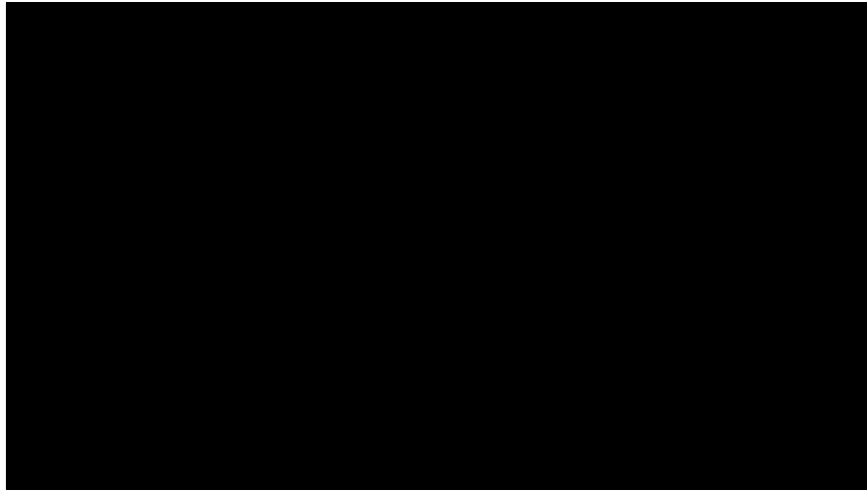
DJI Phantom 4 Package Cost

- Phantom 4 with case
- 3 Extra batteries
- Comm radio
- iPad Air II (128GB)
- Shoulder bag
- Charging station
- Less than \$2,500



UAS at the Iowa DOT





Aviation

- Airports
 - Asset analysis, planning, and promotional
- Heliports
 - Directory



Survey transportation assets during natural disasters



Design

- Right of way survey for highways and bridges (in house/contracted)
- Bridge survey (internal test)
- Purchased DJI Phantom 4



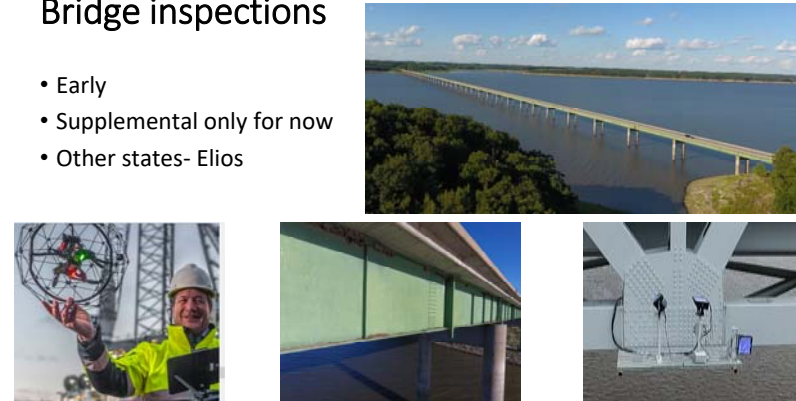
Location and Environment

- Wapello multi-spectral terrain data with Lidar/IR (contracted)
 - HWY 61 project and research for future
- Waterman Creek wetland mitigation
- Purchased DJI Phantom 4



Bridge inspections

- Early
- Supplemental only for now
- Other states- Elios



Other

- Traffic ops
 - Traffic analysis, crash investigation/clearance- concept for now
- Light/overhead sign inspections



UNMANNED AIRCRAFT SYSTEMS (DRONES)

USES & BENEFITS

CAPABILITIES

High resolution photography and video

CURRENT USES

- | | | |
|------------------------|-----------------------|-----------------------------------|
| • Design survey | • Natural disasters | • Supplemental bridge inspections |
| • Airport inventories | • Wetland mitigations | • Education and outreach |
| • Heliport directories | | |

POTENTIAL FUTURE USES

- | | | |
|---------------------------------|------------------------|--------------------------|
| • Traffic operations | • Crash investigations | • Beyond line of sight |
| • Traffic analysis | • Rail crossings | • Night operations |
| • Structural bridge inspections | • Thermal imaging | • All-weather conditions |

BENEFITS

- | | | |
|----------|---------------|--------------|
| • Safety | • Better data | • Saves time |
|----------|---------------|--------------|

Regulatory Framework

- Federal Aviation Administration
 - Aircraft
 - Airspace
 - Operations
 - Hobby vs. commercial



- Cities/state
 - Can regulate drone operations from public property
 - Privacy
 - Evidence/search warrants

Hobby UAS Guidelines

- No license required
- Must notify airport if within 5 miles
 - B4UFly App
 - Remain clear of manned aircraft!
- Maximum altitude 400'
- Daytime only



- Fly for public agencies in emergencies????? Not legally!

Test 1

1. If you are a hobby UAS operator, can you legally fly uncompensated for PD, FD or any other public purpose or emergency response?



Test 1 cont.

2. If you are a hobby UAS operator who works for a state agency, or local fire and rescue, can you legally use your hobby drone to test a use, or to carry out the mission of your workplace?



So how can we legally fly? Part 107

- FAA Part 107 Regulations for small Unmanned Aircraft Systems
 - Released August, 2016
 - FAA regulatory framework for non-hobby UAS operators
 - Small UAS (sUAS)- 55 lbs. or less
 - Public operators allowed to opt-in
 - Provides clear operating rules and waiver options (see rules)

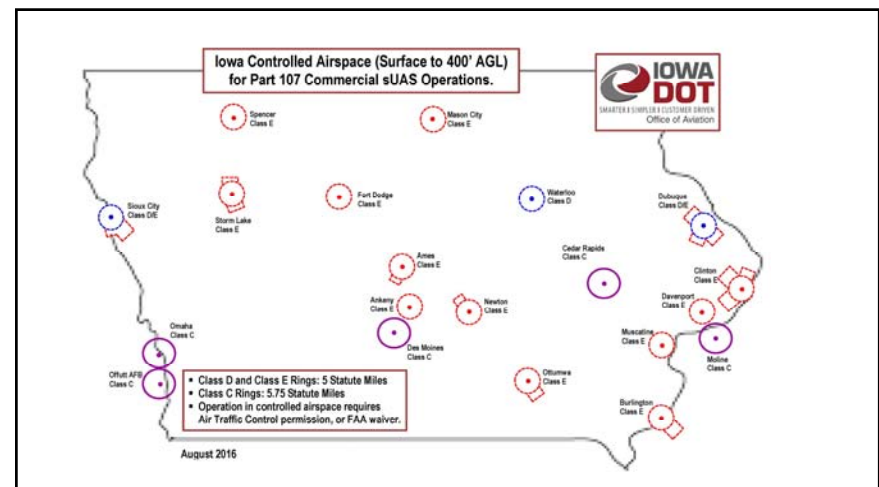


FAA Part 107 Requirements

- **Register UAS** (.55 lbs - 55 lbs)
 - Non-hobby- Registration unique to aircraft
 - Aircraft must be marked with registration number
- **Remote pilot certificate**
 - Non-pilots: Study and take written test at a certified testing center
 - Online courses at Gleim, King Schools, Sporty's, others
 - Current airplane pilots: Online test
- Getting started handout

FAA Part 107 Operating Rules

- Can fly in uncontrolled airspace (see map)
 - controlled airspace protects manned aircraft
- Visual line-of-sight
- Stay under 400 feet
- Daytime only (twilight to twilight)
- Yield right-of-way to manned aircraft
- Must NOT fly over people



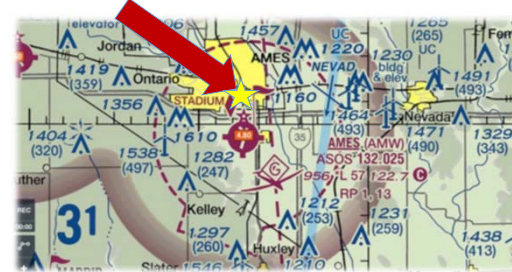
Waivers to Part 107 Rules

- Can apply for flights in controlled airspace, night, over people, etc. (see handout)
 - A. Online application
 - B. FAA guidance
 - C. Be patient!
- Airspace waivers
 - Iowa DOT
 - LAANC coming!
 - Today



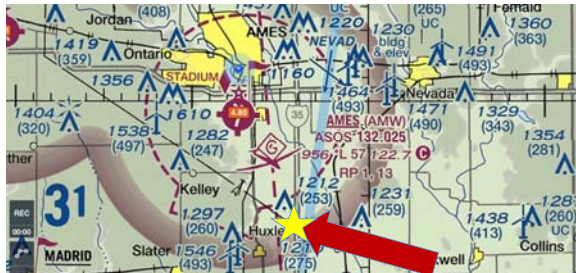
Test 2

1. Flying under Part 107, can you fly at the Iowa DOT main complex in Ames without a waiver (2 miles north of an airport with Class E airspace to the surface)?



Test 2 cont.

2. Flying under Part 107, can you fly at the Iowa DOT weigh station south of Ames on I-35 without a waiver?



Iowa DOT Employees- Part 107 Pilots

- Brian Kuennen- Aviation
- Tim McClung- Aviation
- Jonathan Miranda- Design
- Dan Messerich- Design
- Mike Todsen- Bridge
- Joseph Drahos- Systems Planning
- Jim Galliard- Location and Environment
- Others?

UAS State Level Legislative Concerns

- Privacy
- Governmental photos of private property
- Cost of UAS- public agencies buying more machine/capability than needed
- Correctional facilities
- DOT is monitoring legislation



Options for integrating UAS

- Purchase UAS and operate Part 107
- Hire a Part 107 licensed operator
 - Confirm license and registration
 - Ensure operations comply with Part 107
 - Rules not exempt without FAA waiver
 - Considerations
 - Expertise, control of product, costs, availability



Other considerations

- **UAS Champion**
 - Regs, waivers, equipment, charging etc.
- **Storage**
 - Use One Drive?
 - May warrant special computer needs
- **3D modeling**
 - Special software
 - Computer processing/large hard drive



Lessons learned

- Have a plan, fly the mission, be done
 - Conspicuous or visible?
- Leave margins when flying in the vicinity of vehicles
- Spare batteries and chargers!





Summary

- Applications for unmanned aircraft will continue growing
- Non-hobby UAS now has a regulatory framework
- Now is a time to explore how UAS can improve our work
- Responsible UAS flying is critical!



Questions???

Let's Fly!