Drone Technology
Implications on Policymaking and
Design of the Built Environment

March 13, 2017
Our Panelists

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San Francisco, CA
Roadmap/Lessons Learned for Today

I. Federal, State, and Local Regulations

I. Public and Private Sector Use of Drones

I. Other Emerging Forms of Drone Technology

I. Privacy and Other Legal Obstacles

I. Questions
I. FEDERAL, STATE, AND LOCAL REGULATIONS
Legal Definition

- A drone is classified as an unmanned aircraft system (UAS) by the FAA.
  - A UAS is an aircraft system without a flight crew on board
  - Also known as unmanned aircraft (UA), unmanned aircraft vehicle (UAV), remotely piloted vehicle (RPV)
- The rules for operation depends on why you want to fly a drone.
# Commercial vs. Recreational Use

<table>
<thead>
<tr>
<th></th>
<th>Fly for Fun</th>
<th>Fly for Work</th>
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</thead>
<tbody>
<tr>
<td><strong>Pilot Requirements</strong></td>
<td>No pilot requirements</td>
<td>Must have Remote Pilot Airman Certificate</td>
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<td></td>
<td></td>
<td>Must be 16 years old</td>
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<td></td>
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<td>Must pass TSA vetting</td>
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<tr>
<td><strong>Aircraft Requirements</strong></td>
<td>Must be registered if over 0.55 lbs.</td>
<td>Must be less than 55 lbs.</td>
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<tr>
<td></td>
<td></td>
<td>Must be registered if over 0.55 lbs. (online)</td>
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<tr>
<td></td>
<td></td>
<td>Must undergo pre-flight check to ensure UAS is in condition for safe operation</td>
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<tr>
<td><strong>Location Requirements</strong></td>
<td>5 miles from airports without prior notification to airport and air traffic control</td>
<td>Class G airspace*</td>
</tr>
</tbody>
</table>
## Commercial vs. Recreational Use

<table>
<thead>
<tr>
<th>Operating Rules</th>
<th>Fly for Fun</th>
<th>Fly for Work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Must ALWAYS yield right of way to manned aircraft</td>
<td>Must keep the aircraft in sight (visual line-of-sight)*</td>
</tr>
<tr>
<td></td>
<td>Must keep the aircraft in sight (visual line-of-sight)</td>
<td>Must fly under 400 feet*</td>
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<tr>
<td></td>
<td>UAS must be under 55 lbs.</td>
<td>Must fly during the day*</td>
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<td></td>
<td>Must follow community-based safety guidelines</td>
<td>Must fly at or below 100 mph*</td>
</tr>
<tr>
<td></td>
<td>Must notify airport and air traffic control tower before flying within 5 miles of an airport</td>
<td>Must yield right of way to manned aircraft*</td>
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<tr>
<td></td>
<td></td>
<td>Must NOT fly over people*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Must NOT fly from a moving vehicle*</td>
</tr>
</tbody>
</table>
## Commercial vs. Recreational Use

<table>
<thead>
<tr>
<th>Example Applications</th>
<th>Fly for Fun</th>
<th>Fly for Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational or recreational flying only</td>
<td></td>
<td>Flying for commercial use (e.g. providing aerial surveying or photography services)</td>
</tr>
<tr>
<td>Flying incidental to a business (e.g. doing roof inspections or real estate photography)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Legal or Regulatory Basis</th>
<th>Fly for Fun</th>
<th>Fly for Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAA Interpretation of the Special Rule for Model Aircraft</td>
<td></td>
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</tbody>
</table>
Welcome to the Small Unmanned Aircraft System (sUAS) Registration Service

This site will allow you to register your small UAS with the FAA and update your registration.
Important Historical Regulation

  - Section 333 granted Secretary of Transportation the “authority to determine whether an airworthiness certificate is required for a UAS to operate safely in the National Airspace System (NAS)

**Aug. 2013:** Until then, UAS licenses granted case-by-case requiring public entity sponsor
  - Certificate of Operation (COA)
## 333 exemption vs. Part 107

<table>
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<tr>
<th>Before (333 exemption)</th>
<th>After (Part 107)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot’s license + 333 exemption</td>
<td>Remote Pilot Certificate</td>
</tr>
<tr>
<td>6 month queue for 333 exemption funneled through 1 FAA department</td>
<td>Knowledge test vetted by TSA and administered at 700 centers around the US</td>
</tr>
<tr>
<td>Medical Certificate</td>
<td>Drivers License</td>
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<tr>
<td>Spotter required (2-man crew)</td>
<td>No spotter required</td>
</tr>
<tr>
<td>Required to file NOTAM</td>
<td>No NOTAM required</td>
</tr>
</tbody>
</table>
Federal Laws

- June 2016: FAA and DoT released commercial drone operational rules
  - *The Small Unmanned Aircraft Regulations (Part 107)*
    - Apply to commercial drones under 55 lbs.
    - Drones must remain within operator’s line of sight
    - Drones cannot fly over “unprotected people” unless “they are directly participating in the UAS operation”
    - Max. speed of 100 mph, max altitude of 400 feet
    - Pilots at least 16 years old with remote flying certificate and passed an aeronautical test
      - TSA background tests for all drone pilots
Sample Certificate of Achievement

Certificate of Achievement

This is to certify that

IAN BRADFORD SMITH

has successfully completed the
FAA Safety Team Aviation Learning Center Online Course

Part 107 Small Unmanned Aircraft Systems (sUAS)

Course Number ALC-451
Presented by Online Courses
June 26, 2016

Federal Aviation Administration
Certificate Number 0802143-20160626-00451
State Laws

- Federal regulations preempt air travel, hence state and local laws are limited in terms of regulation
  - **49 U.S. Code § 40103:** Grants federal government exclusive sovereignty of airspace of U.S.
  - FAA: “[a] navigable airspace free from inconsistent state and local restrictions is essential to the maintenance of a safe and sound air transportation system”
  - Several states have passed rules imposing regulations on how law enforcement and other agencies can use drones
    - Virginia: warrant must be issued
    - New Jersey: warrant must be issued, information must be destroyed within two weeks
Case Study: Connecticut

- Legislation considered for restrictions on drone weaponization
Local Laws
Case Study: Schaumburg, IL

- § 109A.02 - OPERATION OF DRONES PROHIBITED. The operation of a drone within one hundred (100) feet of the perimeter of any village property or on any village right-of-way during a special event is hereby prohibited.
Case Study: Barnstable, MA

- SECTION 401A-6(C) Prohibited Activities: “Using, launching, landing or operating an unmanned aircraft from, or on, land or waters associated with any of the Town of Barnstable bathing beaches is prohibited except as approved in writing by the Town Manager”
II.
PUBLIC AND PRIVATE SECTOR
USE OF DRONES
Governmental drone uses

Drone Fleets Could Monitor Bridge Safety

North Dakota Legalizes Armed Police Drones

Switzerland begins postal delivery by drone

Michigan May Use Drones to Study Unpaved Roads

Orland Park Uses Drone To Combat Fire
DRONES: A NEW PERSPECTIVE FOR DESIGN AND PLANNING
EARLY APPLICATIONS OF AERIAL IMAGERY
FIRST AERIAL PHOTOGRAPH – BOSTON, 1860 FROM HOT AIR BALLOON

SOURCE: THE SMITHSONIAN, JAMES WALLACE BLACK
EARLY APPLICATIONS OF AERIAL IMAGERY

1906 POST-EARTHQUAKE SAN FRANCISCO FROM A 50-LB CAMERA ELEVATED BY 9 KITES
EARLY APPLICATIONS OF AERIAL IMAGERY

BAVARIAN PIGEON CORPS (1903) SPY PHOTOGRAPHY

SOURCE: FRANKFURT PHOTO ARCHIVE
CONSTRUCTION DOCUMENTATION + ADMINISTRATION
LIDAR / POINT CLOUD / GIS MAPPING AND SURVEYING

SOURCE: ESRI
HUMAN TRANSPORTATION
EHANG 184 UAV PERSONAL TRANSPORT, DUBAI

SOURCE: WASHINGTON POST
MASS MEDIA + JOURNALISM
PATTERNS OF SOCIAL INEQUITY, CAPE TOWN
SOUTH AFRICA

SOURCE: JOHNNY MILLER
MASS MEDIA + JOURNALISM
DOCUMENTATION OF WAR-TORN NEIGHBORHOODS IN HOMS, SYRIA
PHOTOGRAPHY – BUILT ENVIRONMENT
MONT SAINT MICHELE, FRANCE – JEREMIE ELOY
III.
OTHER EMERGING FORMS OF DRONE TECHNOLOGY
Case Study: Super Bowl LI Halftime Show

Most watched musical event of all time
150 million viewers
Intel Shooting Star drones

- Create array of colored LEDs during synchronized shows
- Each device is 1 foot long and weighs 28 grams
- Currently unclear if will be made available to public for purchase
“Vivid” Sydney Drone Performance - 2016
“Vivid” Sydney Drone Performance - 2016
What made these performances possible from a planning/legal perspective?
FAA “No Drone Zone”

- FAA issued Temporary Flight Restrictions (TFRs) around NRG Stadium for Super Bowl, including drone activities
- “No Drone Zone”
- TFRs stretched 34.5 miles radius area from the stadium
- Drone operator (Intel) granted special dispensation for performance from FAA earlier in the week to film show

Questions: How is this legally radius determined?
No Drone Zone For Those Attending the Super Bowl

The Federal Aviation Administration’s (FAA) latest public service announcement is a reminder that the airspace around NRG Stadium in Houston is a No Drone Zone for the Super Bowl.

Temporary Flight Restrictions will prohibit certain aircraft operations, including unmanned aircraft operations, or drones, within a 34.5-mile radius of NRG Stadium in downtown Houston, Texas on game day. The restrictions will be in effect from 4 p.m. to 11:59 p.m. on Sunday, Feb. 5.

The FAA produced a 20-second video that tells people to bring their lucky jerseys, face paint and team spirit to the game – but to leave their drones at home – because the stadium and the area around it is a No Drone Zone. The agency is promoting the video on Twitter, Facebook, YouTube and the FAA website.

"Drones are becoming much more popular, but they also pose certain safety risks," said FAA Administrator Michael Huerta. "We’re working closely with our safety and security partners to spread the No Drone Zone message as widely as possible."

Watch the video on the FAA YouTube Channel: The Super Bowl is a No Drone Zone: https://youtu.be/7LZjTl2brq0.
Drone Zoning Proposals

- Take time into consideration
  - e.g. Lift ban heights after certain hours
- Allow cities to create public CAD files for drone operators that consider GPS and time sequencing

**Question:** How will cities “zone for drones”? 
Case Study: UAV Zoning for Chicago
Case Study: UAV Zoning for Chicago

- **GREEN**: Free Use
- **YELLOW/ORANGE**: Restricted based on time or day of week
- **RED**: Restricted at all times
Case Study: Buckingham Fountain

Question: Potential to zone at human scale?
Drones as Agriculture Tool

Drones have been used for pollination and aerial imagery purposes by farmers
Case Study: Robotic Bee

Japan’s National Institute of Advanced Industrial Science and Technology
4 cm wide, 15 grams
Case Study: RoboBees

Wyss Institute of at Harvard University
Half the size of a paper clip, under 0.1 gram
Case Study: Plan Bee

Ann Haldewang, Savannah College of Art and Design
Hand-sized, plastic and foam
Drones as Delivery Service

Drones have been tested to deliver products of various types to consumers
Case Study: Amazon Prime Air

- Plans revealed in Dec. 2013
- Packages under 5 lbs. delivered in under 30 minutes
- Successfully used in Cambridge, England
  - First delivery in Dec. 2014
- Granted US testing from FAA in Mar. 2015
IV. PRIVACY AND OTHER LEGAL OBSTACLES
Technology and Government

STARTUP POLICY LAB
Technology and Government

Center for Technology, Society & Policy
UNIVERSITY OF CALIFORNIA, BERKELEY

Citizen Technologist
THE CTSP BLOG
# Technology and Government

## Drone Privacy: Stakeholder Concerns

*Generalized privacy interests based on initial use cases*

(Concern Level: low, medium, high)

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<th></th>
<th>City Dept.</th>
<th>City Employees</th>
<th>Vendors</th>
<th>Other City Dept’s</th>
<th>Public</th>
<th>State &amp; Fed Gov</th>
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<tr>
<td><strong>Collection</strong> (Un/Intentional)</td>
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<td><strong>Data Minimization</strong></td>
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<td><strong>Differentiated Access</strong></td>
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<td><strong>Data Security</strong></td>
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<td><strong>Data Retention</strong></td>
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<td><strong>Data Sharing</strong></td>
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<td><strong>FOIA Analogue Disclosures</strong></td>
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<td><strong>Open Data Platforms</strong></td>
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Privacy Policy-by-Design | 03.2016
NTIA White Paper

- Feb. 15, 2015: Pres. Obama issued Presidential Memorandum instructing National Telecommunications and Information Administration (NTIA) to convene series of stakeholder efforts to increase privacy protections around commercial and private UAS use.
- Led to development of “Voluntary Best Practices for UAS Privacy, Transparency, and Accountability”
Ever Growing Number of Conflicts

- Transportation-Aviation: 218
- Commercial Facilities: 91
- Government Facilities: 62
- Energy: 28
- Emergency Services: 23
- Transportation-Ground & Maritime: 17
- Suspicious Activities: 17
- DOD Installations: 15
- Dams: 11
- Healthcare and Public Health: 9
- Chemical: 6
- Water and Wastewater Systems: 5
- Nuclear Reactors, Materials and Waste: 2
- Food and Agriculture: 1
- Defense Industrial Base: 1
UAS THREAT CATEGORIES

- Surveillance
  - Video Messaging
  - Mission Planning/Reconnaissance
  - Mission Support
  - Security Assessment
- Smuggling
  - Cross Border
  - Prisons Incursion
  - Logistics/Resupply
- Disruption
  - Protest/Harassment
    - Vandalism/Defacement
    - Hoax Threat
    - Cyber Platform
- Weaponization
  - Piloted to Target
    - CBRN Delivery
    - Explosives Delivery
    - Mounted Weapon
  - Laser/Visual Impairment
  - Firearms
Actual Prison Smuggling Attempt
ILLINOIS 725 ILCS 167/1
Freedom from Drone Surveillance Act
Freedom from Drone Surveillance Act

- Prohibits Use of Drones to gather information
  - There are exceptions (Section 15)
  - Non-disclosure (w/ exceptions)
  - Evidentiary Penalties
  - Prohibits Use of Private Drones

- Drone Task Force recommendations due 7/2016
Section 15 Exceptions

- Counter Terrorism (Homeland Security determination of threat)
- Pursuant to search warrant (45 days)
- Exigent circumstances to protect life etc. (48 hrs max with reporting requirement)
- Search for missing person (not a criminal investigation)
- Crime scene and traffic crash scene photography (private property requires consent or search warrant)
- Disaster or Public Health Emergency
Drones and National Parks

Flying Drones at National Parks Can Result in Penalties, Fines

by TOM COSTELLO and EUSHIA FIELDESTADT

Drones are becoming increasingly ubiquitous, but the rules and regulations on where, when and how they can be used are still hazy at best.

Many drone owners know that they should keep their devices away from airports and downtown Washington, D.C., but they might be surprised to find out that they also can’t use them in national parks.

The allure is clear — Big Bend, Yosemite, the Grand Canyon and other national parks can offer spectacular views when filmed from above. But those who try to do it with their drones can face penalties and fines.
V.

QUESTIONS FOR
THE PANELISTS
THANK YOU FOR JOINING US TODAY!

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