The Legal Environment for Commercial Unmanned Aircraft
Overview

• The Legal Environment
  • Who can fly them?
  • A history of FAA policy to the present
  • Asking for permission
Today’s Legal Framework
Who can fly them...legally?

• Public Entities
  • Government Agencies
  • Universities (Land Grant Colleges)
  • Contractors/Subs working for public entities

• Civil
  • Hobby & Recreational Users
  • Commercial Users with Exemptions from the FAA
Today’s Legal Framework
A short history...

- FAA Modernization and Reform Act of 2012
- FAA to consider “Low Risk” Applications for exemption
- First Commercial Applicants
- Interpretation of Special Rule for Model Aircraft
- First Commercial Exemptions
FAA Modernization and Reform Act of 2012

• Congress tasked the FAA to:
  • Designate civilian test ranges
  • Develop certification standards
  • Ensure the safety of UAS and navigation
  • FAA to develop procedures for commercial use of small UAS (<55 lbs) by 2015
    • AKA “The Small Rule”
    • Currently at the White House Office of Information and Regulatory Affairs
    • Expected to be released for public comment in 2014
Model Aircraft Exclusion

FAA Modernization and Reform Act of 2012

• “The Administrator of the FAA may NOT promulgate...regulations regarding model aircraft, if the aircraft...”
  • Is flown strictly for hobby or recreational use
  • Is operated according to AMA guidelines
  • Is not more than 55 pounds
  • Is flown within visual line of sight of the person operating the aircraft
Section 333 Exemptions
March 2014

• FAA considering low-risk applications for Section 333 Exemptions
  • Film Making
  • Oil & Gas Flare Stack Inspection
  • Powerline and Pipeline Inspections
  • Precision Agriculture

“Each UAS will need a detailed and burdensome safety case”
– Jim Williams, Director UAS Integration Office, FAA
Interpretation of Special Rule for Model Aircraft
18 June 2014

• Narrowly defined hobby and recreational purposes
  • "Likewise, flights that are in furtherance of a business, or incidental to a person’s business, would not be a hobby or recreational flight."

• Prevents farmers from flying their own UAS over their own land
## Interpretation of Special Rule for Model Aircraft

18 June 2014

<table>
<thead>
<tr>
<th>Hobby or Recreation</th>
<th>Not Hobby or Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flying a model aircraft at the local model aircraft club.</td>
<td>Receiving money for demonstrating aerobatics with a model aircraft.</td>
</tr>
<tr>
<td>Taking photographs with a model aircraft for personal use.</td>
<td>A realtor using a model aircraft to photograph a property that he is trying to sell and using the photos in the property’s real estate listing.</td>
</tr>
<tr>
<td>Using a model aircraft to move a box from point to point without any kind of compensation.</td>
<td>Delivering packages to people for a fee.</td>
</tr>
<tr>
<td>Viewing a field to determine whether crops need water when they are grown for personal enjoyment.</td>
<td>Determining whether crops need to be watered that are grown as part of commercial farming operation.</td>
</tr>
</tbody>
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First Exemptions

• 25 Sep 2014
  • FAA authorized 7 companies in the Motion Picture Industry to conduct commercial flights

• 10 Dec 2014
  • Clayco – Construction Site Monitoring
  • VDOS – Flare Stack Inspection
  • Trimble – Aerial Surveying
  • Woolpert – Aerial Surveying

• 5 Jan 2014
  • Douglas Trudeau – Real Estate
  • Advanced Aviation Solutions – Agriculture
333 Exemptions Granted to Motion Picture Industry

- Standards more stringent than for Public Entities
  - Pilot must have Private Pilot’s License with 200 UAS flights
    - Pilot must be current in manned aircraft
  - Can’t fly within 500’ of a person without their consent
  - Not within 5 NM of an airport or heliport unless permission received from airport manager
  - Must brief servicing FSDO 5 days prior to the start of operations
  - Must apply for a COA 48 hours in advance of a flight
  - Aircraft must remain below 400'
  - Flights limited to 30 minutes
  - Aircraft must remain within ½ mile of the pilot at all times
  - A Visual Observer is required
333 Exemption Granted to Advanced Aviation Solutions

- Standards more stringent than Public Entities, but less stringent than Motion Picture Industry
  - Pilot must have Private Pilot’s License and Class III Medical
  - Visual Observer within voice distance of the pilot
  - No greater than 1/2 NM from the pilot at all time
  - Day only and clear of clouds
  - Class G airspace below 400' AGL
  - Not over urban or populated areas
  - Not within 5 NM of an airport or heliport
  - Over private/controlled access property with the permission of the land owner/controller
Filing for an exemption

Will farmers be able to fly their own UAS someday?
...and the Magic 8 Ball says...

• Draft for “Proposed Rulemaking”—The Small Rule
  • Originally planned for release in 2011 then Nov 2014
  • At Office of Information and Regulatory Affairs
    • “most important office none of us have ever heard of”
    • Deep plunge study for cost and affects on the public

• Rule contains:
  • Classification of UAS
  • Certification of Pilots
  • Operational Limits
  • Airworthiness Standards
How long will it take?
Why an exemption?

• Small UAS (<55 lbs) are unable to comply with many Federal Aviation Regulations (FARs) due to:
  • Size - i.e. not large enough for 6” tall letters
  • Weight – can’t carry flight manual
  • Power – battery operated plane can’t power a transponder
  • Lack of pilot – no eyes on board to see other aircraft
FAA Policy 8900.227
30 July 2013

• Defines the COA process
• Establishes PIC requirements
  • Requires Private Pilot written exam for operations below 400’ in class G and within ½ NM of pilot at all times
  • All other airspace requires Private Pilot’s License, biennial flight review, and currency in manned aircraft
• Establishes requirements for Visual Observers (VO)
  • Cannot daisy-chain, no binoculars, pilots are not allowed to perform concurrent duties both as the pilot and the VO
  • VOs require training in airspace and FARs
• ALL PICs and VO must have a current Class II Medical
  • Requires small UAS pilots to be medically fit to fly commercial airliners
“UAS Operations by Public Universities for Aeronautical Research”
- Closes a ‘commercial’ loophole
- The university must own the research produced
  - Affects the nature of a university’s relationship with industry and other benefactors
- Must support aeronautical research
- Using an off-the-shelf UAS to conduct agricultural research does not qualify as “aeronautical research” and should NOT qualify as a public aircraft operation
  - Disqualifies day-to-day operations of an Agricultural Extension Service
- Does allow a university to contract and pay a private operator
UAS Advantages

• Airframe tailored to the mission
• Lower altitude...higher resolution
• Cheaper to operate
• Safer to operate
• Open to more operators
UAS Disadvantages

- “Immature Regulatory Environment”
- Situational Awareness – “Soda-Straw”
  - Traffic
  - Somato-sensory Deprivation
- Weather
- The “Link”
- Bias
Airspace at a Glance

Airspace at-a-Glance

Class A
“Above”

AOPA Air Safety Foundation, 800-USA-AOPA, www.aopa.org

FL 600
18,000 MSL

Class B
“Busiest”

Class C
“Communicate”

Class D
“Dialogue”

Class E
“Everywhere Else”

Class G
“Gov’t Free”

14,500 MSL

Nontowered Airports
1200 AGL
700 AGL
AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

Only the controlled and reserved airspace effective below 18,000 ft. MSL are shown on this chart.

Class B Airspace
Class C Airspace (Mode C - see FAR 91.215/AIM.)
Class D Airspace
Class E Airspace
Class F Airspace
Class G Airspace

CLASS G

Class E Airspace with floor 700 ft. above surface that laterally abuts Class G Airspace.
Class E Airspace with floor 700 ft. above surface that laterally abuts 1200 ft. or higher
Class E Airspace with floor 1200 ft. or greater above surface that laterally abuts Class G Airspace

2400 MSL
Differentiates floors of Class E Airspace greater than 700 ft. above surface.

4500 MSL
Class E Airspace exists at 1200’ AGL unless otherwise designated as shown above.
Restricted Airspace

Many Areas of Airspace are Restricted or Prohibited
Current State of U.S. Farms

- A hundred years ago, more than 30% of Americans were directly involved in the agriculture industry; today, the number is less than 2%.

- The Bureau of Labor Statistics anticipates an 8% drop in farmer employment between 2010 and 2020, meaning there will be 96,100 less farmers.

- Market Value of Products Sold: almost $300 billion.

- In a 2012, AP interview, former U.S. Deputy Secretary of Agriculture Kathleen Merrigan said experts also project the world will require 70% more food production by 2050 to keep up with population growth.
UAS Economic Potential

- AUVSI’s Economic Impact Report:
  - The UAS global market is currently more than $11 billion and will total almost $140 billion over the next 10 years.
  - The economic impact of US airspace integration will total over $13.6 billion in the first three years and will grow sustainably for the foreseeable future, cumulating to over $82.1 billion between 2015 and 2025.
  - Precision agriculture will total approximately 80% of the known potential commercial markets for UAS.
Class 1-3 UAS
Class 4 UAS
Class 5 UAS
Rafael Pirker vs FAA

- July 2011 – Pirker hired by University of Virginia to make photos and videos of the campus
- FAA fined Pirker $10,000 for operating his Ritewing Zephyr in a reckless manner
- “Pirker allegedly flew the drone, which weighed less than 5 pounds, at ‘extremely low’ altitudes, including under a pedestrian bridge and directly at a person, causing the individual to duck out of the way.”
- Pirker Appeals
Commercial Drone Pilots Cheer Judge Finding Against FAA

Aerial photographers, surveyors and filmmakers who want to fly small drones in U.S. airspace are able to rejoice after a judge dealt a setback to efforts by federal regulators to rein in use of the unmanned aircraft.

Raphael Pirker, who had been docked $10,000 by the Federal Aviation Administration for using a drone to shoot a promotional video, won dismissal yesterday of the fine for reckless flying. An administrative law judge determined the FAA had no authority over small unmanned aircraft when it imposed the first-ever such fine on a drone operator. The FAA today appealed the decision.
Federal appeal may define FAA authority over drones

Bart Jansen, USA TODAY  5:13 p.m. EDT July 2, 2014

The Federal Aviation Administration's ability to regulate flying drones is at stake in a case before an appeals board that typically investigates transportation accidents.

The case began when the FAA fined Raphael Pirker $10,000 for flying a drone with a camera around the University of Virginia in 2011 to collect video of the campus for Lewis Communications.

But Pirker appealed. Administrative Law Judge Patrick Geraghty ruled in March that there was "no enforceable FAA rule" that applied to a model aircraft, such as the Ritewing Zephyr that Pirker was flying.
NTSB Overturns Pirker Case: Finds For FAA That Drones Are Aircraft Subject To Its Rules

The NTSB issued a much-awaited decision today that will surely be a disappointment to many drone enthusiasts, ruling that Federal Aviation Administration rules that apply to manned aircraft apply to unmanned aircraft or drones. The NTSB reversed a law judge’s ruling in favor of Raphael Pirker and remanded the case for further proceedings. The issues on appeal boiled down to whether unmanned aircraft are defined as aircraft under Federal Aviation Act.
3D Photomosaic

- Image data
- Volume data
- Geo-rectified
Introductions

- Bradley Ward (LtCol, USAF Retired)
  - 2500 hours in KC-135 Stratotanker
  - 1500 hours in MQ-1 Predator
  - 200 hours in RQ-4 Global Hawk
  - 2 years at the Pentagon
  - Squadron Operations Officer
  - Squadron Commander
Let’s decide on a name...

- Drone
- Remote Controlled Aircraft
- Remotely Piloted Vehicle (RPV)
- Unmanned Aerial Vehicle (UAV)
- Unmanned Aircraft System (UAS)
- Remotely Piloted Aircraft (RPA)
Same name...  
...vastly different aircraft

SenseFly eBee  
Northrop Grumman RQ-4 Global Hawk
Single-Link LOS System

- Aircraft
- Payload
- GCS
- Datalink

RQ-14 Dragoneye
Multi-Link Beyond LOS

- Aircraft
- Payload
- GCS
- Datalink
Single Link – LOS System

- Aircraft: Skywalker Foamy
- Payload: Canon SX260
- GCS: Windows Tablet
- Datalink: 2.4 GHz (R/C)
Uses for UAS
## Civil Applications

<table>
<thead>
<tr>
<th>Non-Military UAS Applications</th>
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<tbody>
<tr>
<td>Border Surveillance</td>
<td>Pipe/Power Line Surveillance</td>
</tr>
<tr>
<td>Suspect Tracking</td>
<td>Agricultural Applications</td>
</tr>
<tr>
<td>Traffic Monitoring</td>
<td>Communications/Broadcast</td>
</tr>
<tr>
<td>Disaster Response/Relief</td>
<td>Movie Production</td>
</tr>
<tr>
<td>Damage Assessment</td>
<td>Aerial News Coverage</td>
</tr>
<tr>
<td>Atmospheric/Weather Research</td>
<td>Mail/Freight Transport</td>
</tr>
<tr>
<td>Critical Infrastructure Monitoring</td>
<td>Flood Mapping</td>
</tr>
<tr>
<td>Damage Surveying</td>
<td>Real-estate Mapping</td>
</tr>
<tr>
<td>Aerial Photography</td>
<td>Mining</td>
</tr>
<tr>
<td>Wildlife Monitoring</td>
<td>Sporting Event Coverage</td>
</tr>
</tbody>
</table>
2011 Pygmy Rabbit Landscape Habitat Survey, Idaho

Objectives

- Evaluate the use of unmanned aerial systems (UAS) to remotely sense the following:
  - cover (e.g., concealment and transparency)
  - diet (e.g., nutrients and chemical defenses)
  - temperatures across the landscape
  - to overlay these attributes with remotely sensed movement and habitat use by wildlife
- Data generated can aid in land use decisions made by agencies for habitat conservation.
Fire Detection & Monitoring

Electro-Optical Video of Prescribed Burn

Infrared Video of Prescribed Burn
River Erosion Survey
South Dakota
Crop Monitoring
Normalized Difference Vegetation Index
Comparison of Available Systems
Fixed Wing

- Precision Hawk
- Ag Eagle
- Vireo
## Fixed Wing Comparison

<table>
<thead>
<tr>
<th></th>
<th>3dRobotics Aero</th>
<th>Trimble UX5</th>
<th>SenseFly eBee</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Camera</strong></td>
<td>Sony a6000</td>
<td>Sony Nex5R (16MP)</td>
<td>Canon S110 (12MP)</td>
</tr>
<tr>
<td></td>
<td>(24MP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>3.0</td>
<td>3.8</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Endurance</strong></td>
<td>40 min</td>
<td>30 min</td>
<td>30 min</td>
</tr>
<tr>
<td><strong>Acres/Sortie</strong></td>
<td>250</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td><strong>Gnd Cntl Station</strong></td>
<td>Tablet+R/C Radio</td>
<td>Trimble Tablet</td>
<td>Windows Tablet</td>
</tr>
<tr>
<td><strong>Launcher</strong></td>
<td>Hand</td>
<td>Catapult*</td>
<td>Hand</td>
</tr>
</tbody>
</table>
Multi-Rotor

- 3DR X8-M
- DJI Phantom 2

- 15 min
- ~25 acres