Emerging Risk: Drones

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Session Objectives

1. Define drones and various types
2. Discuss the current marketplace for drones
3. Explore new types of risks associated with drones
4. Understand the current regulatory environment
5. Discuss the benefits of drone use
6. Share experiences and Q&A
What is a “Drone”? 

• Popular name for a Unmanned Aerial Vehicle (UAV) 

• “Device used or intended to be used for flight in the air that has no onboard pilot” (Federal Aviation Administration Roadmap) 

• Part of an Unmanned Aircraft System (UAS)
Drone Types and Sizes

• Types
  – Fixed-wing
  – Single rotor
  – Multi-rotor

• Sizes
  – PD-100 Black Hornet
    • 18 grams
    • 4.7 inch rotor span
  – RQ-4 Global Hawk
    • 12,133,596 grams
    • 720 inches long
    • 1,584 inch wingspan
First Drone to Hit Aircraft - Canada
Types of Platforms Being Used

- Rotary Wing: 90%
- Fixed Wing: 10%
## Types of Platforms Being Used

<table>
<thead>
<tr>
<th>Rotary-Wing Type</th>
<th>% of Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Rotor (Quadcopter)</td>
<td>74.70%</td>
</tr>
<tr>
<td>8-Rotor (Octocopter)</td>
<td>18.90%</td>
</tr>
<tr>
<td>6-Rotor (Hexacopter)</td>
<td>5.50%</td>
</tr>
<tr>
<td>Helicopter</td>
<td>0.60%</td>
</tr>
<tr>
<td>12-Rotor and other</td>
<td>0.30%</td>
</tr>
</tbody>
</table>
## Insurance Industry Spotlight

<table>
<thead>
<tr>
<th>Insurance Industry Platform Stats</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Fixed Wing</td>
</tr>
<tr>
<td>40 Rotary Wing</td>
</tr>
<tr>
<td>Ave. weight: 7.09 pounds</td>
</tr>
<tr>
<td>3.37% micro UAS</td>
</tr>
<tr>
<td>Ave. endurance: 27.44 min.</td>
</tr>
</tbody>
</table>
## Popular Drone Models

<table>
<thead>
<tr>
<th>#</th>
<th>Model Name</th>
<th>Estimated Price USD</th>
<th>Flight Time</th>
<th>Model Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>DJI Phantom 3</td>
<td>$699 - Check todays price</td>
<td>17 - 20min</td>
<td>Medium</td>
</tr>
<tr>
<td>2.</td>
<td>DJI Inspire 1</td>
<td>$2899 - Check todays price</td>
<td>18 - 20min</td>
<td>Large</td>
</tr>
<tr>
<td>3.</td>
<td>Yuneec Q500 4K</td>
<td>$1300 - Check todays price</td>
<td>20 - 25min</td>
<td>Medium</td>
</tr>
<tr>
<td>4.</td>
<td>3DR Solo</td>
<td>$999 - Check todays price</td>
<td>20 - 25min</td>
<td>Medium</td>
</tr>
<tr>
<td>5.</td>
<td>Hubsan X4</td>
<td>$45 - Check todays price</td>
<td>5 - 7min</td>
<td>Very small</td>
</tr>
</tbody>
</table>
Popular Drone Models

DJI Quantum Copter
Popular Drone Models

Parrot AR Drone 2.0 Elite Edition Quadricopter
Popular Drone Models

3D Robotics X8
Footage from UAS demonstrating Use Cases

• Here is the link to run the Times, Inc. video: http://ti.me/1qgesj0
The Drone Marketplace

COMMERCIAL UAS EXEMPTIONS
BY THE NUMBERS

- 3 years of integration
- 70,000 jobs
- $13.6 billion

• Business Insider, June 2016: project $12 billion in revenues from drones
  – just over $8 billion in 2015.
  – Consumer drone shipments will quadruple in next 5 years
The Drone Marketplace, cont.’d.

Exemptions: 5,521

Location:
- Aerial Photography: 4,789
- Real Estate: 3,434
- Aerial Inspection: 2,789
- Aerial Survey: 2,249
- Construction: 1,675
- Infrastructure: 1,352
- Agriculture: 1,349
- Filmmaking: 1,269
- Event: 977
- Advertising: 759
- Environmental: 669
- Search and Rescue: 669
- Emergency Management: 591
- Utilities: 397
- Landscape: 250
- Training: 136
- Oil and Gas: 100
- Newsgathering: 23
- Closed Set Filming: 20
- Mining/Landfill: 1
- R&D: 1
- Sports: 1
- Security: 1
- Insurance: 1
- Flare Stack Inspection: 1
- Education: 1
- Risk Management: 1
- Demos: 1
- Forensic/Accidents: 1
- Maritime Operations: 1
- Railroad: 1
- Market Research: 1
- Aerial Communications Services: 1
- Supply Chain/Inventory: 1
- Aerial Delivery: 1
- Paving: 1
- Light Show: 1
- Mill Operations: 1
## Platform Sales by Country

<table>
<thead>
<tr>
<th>Manufacturer Location</th>
<th>Total Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>$3,609,215.09</td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td><strong>$2,568,780.00</strong></td>
</tr>
<tr>
<td>China</td>
<td>$2,210,537.00</td>
</tr>
<tr>
<td>Switzerland</td>
<td>$1,078,000.00</td>
</tr>
<tr>
<td>Germany</td>
<td>$641,608.00</td>
</tr>
<tr>
<td>Latvia</td>
<td>$110,000.00</td>
</tr>
<tr>
<td>New Zealand</td>
<td>$104,413.54</td>
</tr>
<tr>
<td>Slovenia</td>
<td>$100,107.00</td>
</tr>
<tr>
<td>Japan</td>
<td>$86,000.00</td>
</tr>
<tr>
<td>Belgium</td>
<td>$60,000.00</td>
</tr>
<tr>
<td>Netherlands</td>
<td>$55,000.00</td>
</tr>
<tr>
<td>France</td>
<td>$50,006.97</td>
</tr>
<tr>
<td>Australia</td>
<td>$40,000.00</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>$33,103.82</td>
</tr>
<tr>
<td>South Africa</td>
<td>$28,971.00</td>
</tr>
<tr>
<td>Austria</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>South Korea</td>
<td>$17,500.00</td>
</tr>
<tr>
<td>Taiwan</td>
<td>$5,787.59</td>
</tr>
</tbody>
</table>
## Platforms Manufactured by State

<table>
<thead>
<tr>
<th>State</th>
<th># of Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>140</td>
</tr>
<tr>
<td>Florida</td>
<td>19</td>
</tr>
<tr>
<td>Washington</td>
<td>18</td>
</tr>
<tr>
<td>North Carolina</td>
<td>14</td>
</tr>
<tr>
<td>Colorado</td>
<td>10</td>
</tr>
<tr>
<td>Illinois</td>
<td>10</td>
</tr>
<tr>
<td>Maryland</td>
<td>8</td>
</tr>
<tr>
<td>Ohio</td>
<td>8</td>
</tr>
<tr>
<td>Kansas</td>
<td>7</td>
</tr>
<tr>
<td>Arizona</td>
<td>7</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>5</td>
</tr>
<tr>
<td>Texas</td>
<td>3</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>2</td>
</tr>
<tr>
<td>Minnesota</td>
<td>2</td>
</tr>
<tr>
<td>Tennessee</td>
<td>2</td>
</tr>
<tr>
<td>Idaho</td>
<td>1</td>
</tr>
<tr>
<td>Missouri</td>
<td>1</td>
</tr>
<tr>
<td>Mississippi</td>
<td>1</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>1</td>
</tr>
<tr>
<td>Oregon</td>
<td>1</td>
</tr>
<tr>
<td>South Carolina</td>
<td>1</td>
</tr>
<tr>
<td>Virginia</td>
<td>1</td>
</tr>
</tbody>
</table>
TOP20 Drone Operator Ranking 2018

<table>
<thead>
<tr>
<th>RANK</th>
<th>COMPANY</th>
<th>MAIN CATEGORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ZIPLINE</td>
<td>DELIVERY</td>
</tr>
<tr>
<td>2</td>
<td>MEASURE</td>
<td>INSPECTION, MAPPING/SURVEYING</td>
</tr>
<tr>
<td>3</td>
<td>CYBERHAWK</td>
<td>INSPECTION</td>
</tr>
<tr>
<td>4</td>
<td>HEMAV</td>
<td>MAPPING, INSPECTION</td>
</tr>
<tr>
<td>5</td>
<td>FLIRTEY</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SKY-FUTURES</td>
<td>DELIVERY</td>
</tr>
<tr>
<td>7</td>
<td>AERODYNE</td>
<td>INSPECTION, SURVEY</td>
</tr>
<tr>
<td>8</td>
<td>AIRINOV</td>
<td>AGRICULTURE</td>
</tr>
<tr>
<td>9</td>
<td>TERRA DRONE</td>
<td>SURVEYING, MAPPING/INSPECTION</td>
</tr>
<tr>
<td>10</td>
<td>SKYSPEC</td>
<td>INSPECTION</td>
</tr>
<tr>
<td>11</td>
<td>SKEE</td>
<td>MAPPING/SURVEYING, INSPECTION</td>
</tr>
<tr>
<td>12</td>
<td>DEVERON UAS</td>
<td>AGRICULTURE</td>
</tr>
<tr>
<td>13</td>
<td>FLYTREX</td>
<td>DELIVERY</td>
</tr>
<tr>
<td>14</td>
<td>SHARPER SHAPE</td>
<td>INSPECTION, MAPPING/SURVEYING</td>
</tr>
<tr>
<td>15</td>
<td>MARTTEK AVIATION</td>
<td>INSPECTION, SEARCH &amp; RESCUE</td>
</tr>
<tr>
<td>16</td>
<td>IDENTIFIED TECHNOLOGIES</td>
<td>INSPECTION, MAPPING/SURVEYING</td>
</tr>
<tr>
<td>17</td>
<td>AZUR DRONES</td>
<td>MAPPING/SURVEYING, INSPECTION</td>
</tr>
<tr>
<td>18</td>
<td>AUSTRALIAN UAV</td>
<td>MAPPING/SURVEYING, INSPECTION</td>
</tr>
<tr>
<td>19</td>
<td>TEXO DRONE UAV</td>
<td>MAPPING/SURVEYING, INSPECTION</td>
</tr>
<tr>
<td>20</td>
<td>THE SKY GUYS</td>
<td>INSPECTION, MAPPING/SURVEYING</td>
</tr>
</tbody>
</table>

Feb. 2018, basis of assessment: The ranking is based on the following indicators with different emphasis stated in brackets: Size of company (1), number of followers (1), amount of funding (1), number of partnerships (0.5), and the extent of web activity (two different categories with an emphasis of 1.5). The highest scoring company in each dimension receives a rating of 100%, while all other drone companies receiving a lower percentage in linear relation to the score of the highest ranking company. The total score is an average of all four measured dimensions. A company can reach an index of 100% if it leads all considered sources.
Drone Marketplace - Summary

The FAA has predicted there could be as many as 600,000 drones used for commercial operations during the next year. As 9/1/16, it said, there were only 18,940 registered for commercial purposes.
UAS Commercial Use Applications

UAS are already being used in a variety of applications, and many more areas will benefit by their use, such as:
Drones – Hazards & Risk

• Drone operators
• Property damage
• First and third party liability
• Personal Injury
• Data protection
• Data ownership
• Manufacturers / Servicers
• Users of drone services
Drone Footage
Drones – Damage to UAS

Exposure exists:

• In use or during flight
• In transit
• In storage
• Repair/replacement costs highly variable
• Who owns payload?
• What is operating environment?
• Who pays for time when drone cannot be used?
• Will uninsured drone coverage be needed?
Damage to Other Property

• Exposure exists in use, transit, or storage as well
• How is drone transported to site?
• Where is drone fueled?
• What fail-safes are in place in case of loss of power/control?
• Does drone deploy objects?
Drone-Equipped UPS Package Car
Bodily Injury

• Potential for both first-party and third-party injuries.

• Drones in use can cause injuries by:
  – Direct or indirect strikes
  – Misapplication/delivery of payloads
  – Other falling objects
  – Accidents getting to and from use location
  – What about near-misses?
Personal Injury

• Any camera- or microphone-equipped drone may be used to:
  – Invade privacy
  – Stalk or harass
  – Internet permits wide dissemination
  – Drone use may also cause a nuisance
I see you have guests.

You may also be interested in curtains.
Other Hazards

• Data protection
• Corruption/Damage
• Mis-delivery/Interception
• Sharing with Others
• Data ownership
• Non-owned liability for users of drone services
Risk Assessment

• There is no reliable data on damages that may be caused by a UAV

• A study reviewed several insurance applications

• Key risk parameters identified:
  – What are the UAS characteristics?
  – Describe UAS storage/maintenance
  – What are the operator qualifications?
  – Describe the mission/operating environment for drone use
UAS Characteristics

• Make and model of drone
• Type of propulsion system or fuel
• Weight and lift capacity
• Speed or operating range
• Launch and recovery methods
• Safety features/attributes
• Payload
Storage

• Location
• Building construction
• Fire protection
• Security
• Fuel storage
Maintenance

- History
- Maintenance in accordance with manufacturer specifications
- Recordkeeping and reports
Operator Qualifications

- Skill level
- Aviation experience
- Medical fitness
- FAA/Air Transport Canada have defined knowledge requirements and now permit operators who pass a knowledge test to operate a UAS
- Pilot training varies in content/quality
- No MVR equivalent
Mission/Operating Environment

• Purpose of drone use
• Location of work
• Duration of flight
• Weather conditions
• Time of day
• External hazards
Current Rules in Canada

• Until the proposed regulations become law, recreational users must comply with the rules in the revised Interim Order (*Interim Order No. 8 Respecting the Use of Model Aircraft*).

• Read about current rules and guidelines for Flying your drone safely and legally
Recreational Users

- Within 90 m above the ground or lower
- At least 30 m away from vehicles, vessels, and the public (if your drone weighs more than 250 g up to 1 kg)
- At least 75 m away from vehicles, vessels, and the public (if your drone weighs more than 1 kg up to 35 kg)
- At least 5.5 km from aerodromes (any airport, seaplane base, or areas where aircraft take-off and land)
- At least 1.8 km away from heliports or aerodromes used exclusively by helicopters
- Outside of controlled or restricted airspace
Recreational Users

• At least 9 km away from a natural hazard or disaster area
• Away from areas where it could interfere with police or first responders
• During the day and not in clouds
• Within your sight at all times
• Within 500 m of yourself or closer
• Only if clearly marked with your name, address and telephone number
• If you fly your drone not following these rules, you could face fines up to $3,000
Current Rules in Canada

• Non-recreational users must continue to seek authorization from Transport Canada to operate through a Special Flight Operations Certificate (SFOC), unless they meet the strict safety conditions in their exemptions.
Proposed Rules for Drones in Canada

Very small drone operations
Very small drone more than 250 g to 1 kg

Most recreational users will fit into this category. The rules that apply are easy to understand and follow. Pilots must be 14 years old or older and will be required to:
• mark their device with their name and contact information;
• pass a basic knowledge test;
• have liability insurance; and
• fly at least:
  • 5.5 km from airports
  • 1.85 km from heliports
  • 30 m from people
Proposed Rules for Drones in Canada

Limited operations (rural)
Small drone more than 1 kg to 25 kg

This category is for users operating in rural areas (e.g., agricultural purposes, wildlife surveys, natural resources).

Pilot must be 16 years old or older and will be required to:
- **mark their device** with their name and contact information;
- pass a **basic knowledge test**;
- have **liability insurance**; and
- fly at least:
  - 5.5 km from airports
  - 1.85 km from heliports
  - 150 m from open-air assemblies of people (i.e. outdoor concert)
  - 75 m from people, vehicles, vessels
  - 1 km from built-up areas
Proposed Rules for Drones in Canada

Complex operations (urban)
Small drone more than 1 kg to 25 kg

This category is for users who intend to fly in urban areas, within controlled airspace or close to anywhere that airplanes, helicopters and floatplanes land and take off.

Pilot must be 16 years or older and will be required to:
• hold a pilot permit that is specific to small drones;
• have liability insurance;
• register and mark their device with a unique identification Transport Canada will provide;
• operate a drone that meets a design standard;
• follow a set of flight rules;
Proposed Rules for Drones in Canada

Complex operations (urban) cont.
Small drone more than 1 kg to 25 kg

• get approval from air traffic control when flying in controlled airspace or near aerodromes; and
• fly at least:
  • 150 m from open-air assemblies of people (i.e. outdoor concert) unless at least 90 m high
  • 30 m from people, vehicles, vessels
ALL DRONES MUST BE KEPT ON A LEASH
NO DRONE ZONE.

PERMIT REQUIRED

DRONES INTERDIT

PERMIS REQUIS
No Drone Zones – Transport Canada

• “No drone zones” are areas where it may be unsafe or illegal to fly your drone.

• When you fly a drone for any reason you should generally not fly:
  – around airports and aerodromes
  – in busy, populated areas
  – in national parks
  – over border crossings

• You can only fly your drone in these areas for specific purposes by getting permission from Transport Canada.
National Research Council Canada
UAV Site Selection Tool
Manufacturer/Servicing Company Liability

Traditional hazards such as:

• Product liability or completed operations exposures
• Parties involved
• Loss control analysis
• Areas of concern:
  • Limited product safety standards
  • Dynamic ‘state of the art’
  • Post-sale obligations are unclear
  • Manufacturer’s product safety experience varies
Coverage Options

Common coverages:
• Physical damage to UAS
• Third Party Liability
• Most coverage is written on modified aviation or liability forms
• ISO multi-state drone endorsements for CGL and Excess/Umbrella programs effective on 6/1/15.
SkyWatch, STARR to Offer Usage-Based Insurance to Drone Industry
Oversight and Advisory Committees

Drone Advisory Committee

NTIA **Drone Best Practices** – Multistakeholder group

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Press Release – Drone Advisory Committee to Hold Inaugural Meeting

For Immediate Release

August 31, 2016

Contact: Laura Brown or Les Dorr
laura.j.brown@faa.gov, les.dorr@faa.gov
Phone: 202-267-3883

WASHINGTON – The newly established Drone Advisory Committee (DAC) will hold its inaugural meeting on September 16 as the Federal Aviation Administration (FAA) continues to build on its strong record of collaborating with the aviation community to safely integrate unmanned aircraft into the nation’s airspace.
Using Drones In Insurance
Advisory Committees

- **Property Drone Consortium**: The Property Drone Consortium (PDC), a collaboration that consists of insurance carriers, roofing industry leaders and supporting enterprises [http://www.propertydrone.org/](http://www.propertydrone.org/)

Drone Benefits

• Search & Rescue Missions
• Inspections
• Non-Destructive Testing
• Construction
SAR Missions
Inspections
NDT Testing
Construction

1. Improve asset and material management
2. Improve quality
3. Minimize rework
4. Improve safety
5. Mitigate litigation
6. Improve owner’s visibility
7. Win more business
Drones – The Future is Now!
Dubai Police Flying Motorbike Drone Hybrid
First Passenger Drone
Firefighting
Airbus Pod/Car/Drone
User Experience

• Questions

• Comments

• Drone use for work?
I love talking about my remote control aircraft.

I can drone on and on and on about it.
Thank You!

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SVP, Business Development
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