

UAS in Canada - 2015

Stewart Baillie
Chairman

Unmanned Systems Canada
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My Focus Today.....

- *Report on the growth of the UAS sector in Canada as a whole*
- *Provide background on UAS regulation in Canada and on further developments underway*
- *Leave you with some comments on the next steps for regulation and BVLOS*

Unmanned Systems Canada

- **Close to 800 members representing business, government, academia**
- **To represent and promote the interests of the Canadian unmanned vehicle systems community. (Land, Sea and Air)**
 - *Outreach,*
 - *Education,*
 - *Media Relations*
 - *Regulation Development*
 - *“Matchmaking”*
 - *Journal of Unmanned Vehicle Systems*
 - *“Community Building”*



Canadian Unmanned Sector

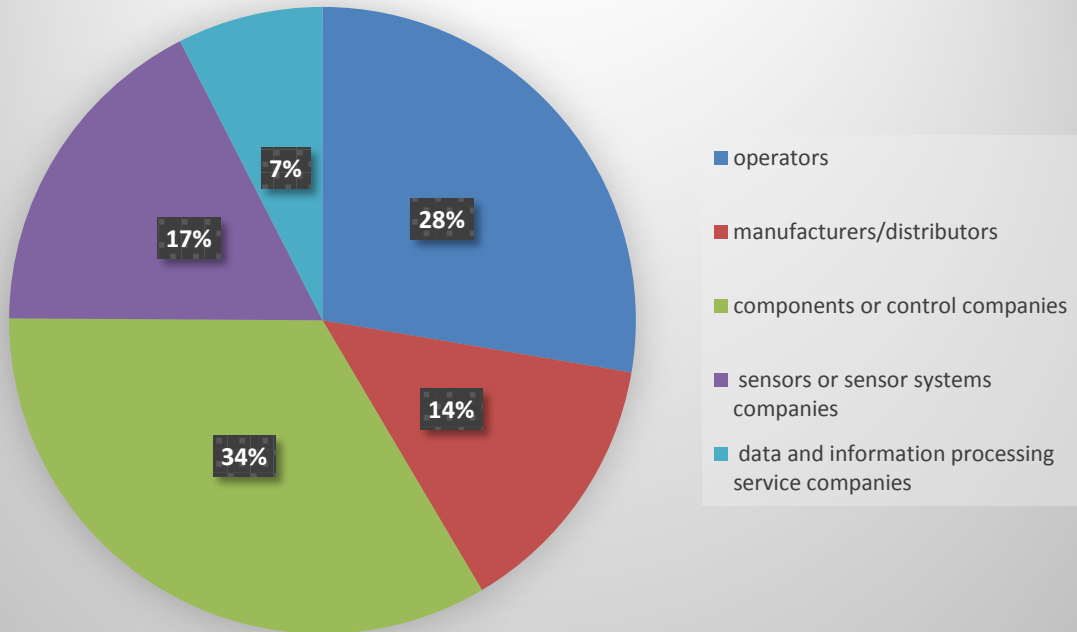
- **An increasing number of authorizations - 1672 in 2014!**



Canadian Unmanned Sector

- **Over 300 companies UAS related companies (March 2014)**

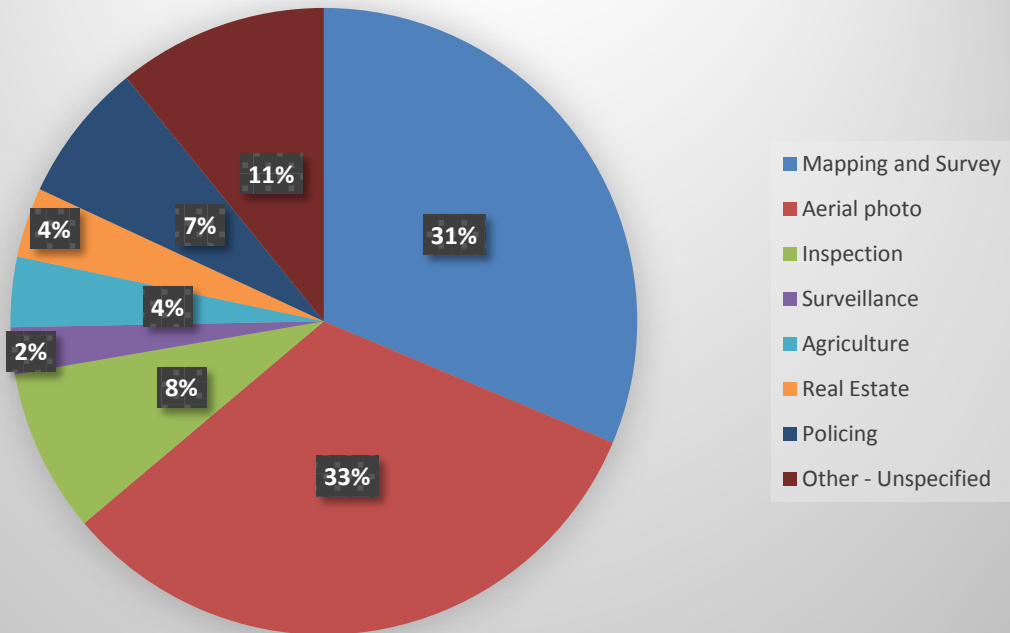
"Identified" UAS Companies - 2014



Canadian Unmanned Sector

- *A wide range of Commercial Operations*

What UAS Operators Are Doing.



Canadian Unmanned Sector

- *Global estimates for the size of the UAS market are wide ranging but compelling:*

\$ 800 M to \$4.5 B / year!

- *All of this depends on:*
 - *Permissive yet safe regulation that includes BVLOS*
 - *Development of BVLOS- enabling technology (SAA, Lost Link)*
 - *Further refinement of existing UAS technologies*
 - *Continued adoption by industry fueled by commercial success*
 - **Public Acceptance**

UAS Regulation in Canada

(since 1996....)

- *All Canadian airspace is controlled by either Transport Canada or DND (The Canadian Aeronautics Act)*
- *Privacy is the mandate of the “Privacy Commissioner” and is separate from Transport Canada!*
- *UAV are explicitly included in the regulations!*
- *Commercial operations of UAV are allowed!*
- *Since 2007, USC and Industry have been working with TC to develop and refine the regulations:*
 - *2007 Working Group to “Define UAV Regulation”*
 - *2007 Revisions to SFOC Staff Instruction*
 - *2010 Initiation of CARAC Working Group on UAV Program Design*
 - *Involvement in current Notice of Proposed Amendment (NPA)*

First, the Bad News...



➤ **Failure to have the proper authorization**

- Individual Fine up to \$5,000.00
- Company Fine up to \$25,000.00

➤ **Failure to comply with issued authorization**

- Individual Fine up to \$3,000.00
- Company Fine up to \$15,000.00

➤ **Unauthorized Operation within a restricted area**

- Individual Fine up to \$25,000.00 and up to 18 months in jail!

➤ **Hazardous operation of a model aircraft** – penalties as defined in court!

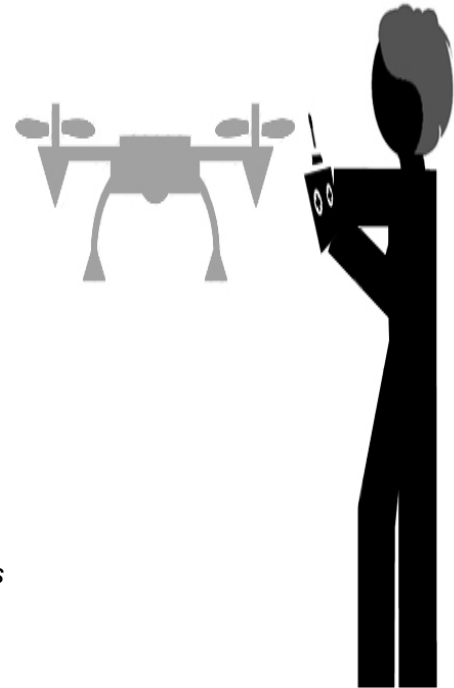
Three Paths to UAS Operation - 1

➤ Model Aviation

- *For “recreational purposes” only – all you get is a smile!*

➤ TC issued Guidelines

- *Under 35 Kg*
- *Kept within Visual Line of Sight (VLOS)*
- *Respecting the privacy of others*
- *And specifically:*
 - *Not within 9 km of an airport, heliport or aerodrome*
 - *Not higher than 90 m above ground level*
 - *Not within 150 m of people / buildings / vehicles*
 - *Not near populated areas (beaches, sporting events, etc.)*
 - *Not near moving vehicles, not distracting to drivers*
 - *Not within restricted airspace*
 - *Not interfering with first responders.*



Three Paths to UAS Operation - 2

➤ Special Flight Operating Certificate (SFOC)

- *No size limit, although smaller = easier*
- *Issued by Transport Canada Regional Inspectors*
- *Application basically describes the risks of the operation and how each is being addressed (BVLOS is considered a big risk!)*
- *Approval based on “acceptable risk management” by operator*
- *May be for an individual site, date and flight or a “blanket” operation*
- *Includes operations for “hire and reward”*
- *Applications based on TC Staff Instruction SI-623-001, issued 2014-11-19 (available to the public!)*



Three Paths to UAS Operation - 3 Exemptions from SFOC requirement

Key Conditions as of Nov 27, 2014

"Lowest Risk" Operation 37 Conditions	"Minimal Risk" Operation 58 Conditions
UAS under 2 Kg MTOW	UAS between 2.1 and 25 Kg MTOW
Liability Insurance of at least \$100K	Liability Insurance of at least \$100K
Daylight, Good Weather	Daylight, Good Weather
Continuous, unaided visual contact	Continuous, unaided visual contact
At or below 300 ft. at all times	At or below 300 ft. at all times
Class G airspace	Class G airspace
Not within 5 nm of: Forest Fires, Airports, Built up Areas	Not within 5 nm of: Forest Fires, Airports, Built up Areas
Not within 100 ft. of people, things	Not within 500 ft. of people, things
Trained in conformance with TC Guidance Material	Pilot Ground School training + Trained in conformance with TC Guidance Material
Pilot must be 18 yr. old (special case for 16-18)	Pilot must be 18 yr. old
	Operation Reports via Email to TC

More Information Available....

➤ **Transport Canada Web site: tc.gc.ca/safetyfirst**

You're responsible to use your unmanned aircraft safely and legally

Always:

- Fly during daylight and in good weather (not in clouds or fog)
- Keep your aircraft in sight where you can see it with your own eyes.
- Make sure your aircraft is safe for flight before take-off.
- Know if you need permission to fly and when to apply for a Special Flight Operations Certificate.
- Respect the privacy of others – avoid flying over private property or taking photos or videos without permission.

Do not fly:

- Closer than 9 km from an airport, heliport, or aerodrome.
- Higher than 90 metres.
- Closer than 150 metres from people, animals, buildings, structures, or vehicles.
- In populated areas near large groups of people – such as beaches, sporting events, outdoor concerts, festivals, or fireworks shows.
- Near moving vehicles – avoid highways, bridges, busy streets or areas where you could endanger or distract drivers.
- Within restricted airspace, including near or over military bases, prisons, and forest fires.
- Anywhere you may interfere with first responders.



tc.gc.ca/safetyfirst 

Flying an unmanned aircraft?
You may need permission from Transport Canada




Do you need permission, but you must meet the exemption requirements?

- Fly during daylight and in good weather
- Always keep your aircraft in sight
- Respect the privacy of others
- Don't fly close to airports, populated areas, near moving vehicles, or higher than 90 metres

Do you need permission and flight requirements?

1. Contact information
2. UAV model
3. Description of operation
4. Geographic boundaries

tc.gc.ca/safetyfirst 

Exemption requirements for operating UAVs without permission

THIS INFORMATION IS FOR USE OF REFERENCE ONLY. YOU MUST CONSULT THE OFFICIAL INSTRUMENTS.

UAVs 2 kg or less	UAVs between 2.1 kg and 25 kg
<ul style="list-style-type: none"> • Be safe, well trained and know the rules of the air • Be 18 years old, or at least 16 years old if contact insured or under qualified supervision • Have at least \$100,000 liability insurance • Have a valid driver's licence and a valid flight to aircraft • Fly only in Class G airspace • Do not exceed 100 m AGL and 100 m from any person, animal, building, structure, or vehicle • Carry a radio if you are operating in Class G airspace • Have your UAV in direct line of sight and always be able to see it with your own eyes • Carry a copy of your UAV registration card of liability insurance, contact information, and aircraft identification • Have your aircraft in direct line of sight and always be able to see it with your own eyes • Verify that your drone's transmission won't affect control of your UAV • Have an emergency plan ahead of time • Carry a copy of your UAV registration card of liability insurance, contact information, and aircraft identification • Follow the manufacturer's operating and emergency procedures, including those for the remote control loss, should you be unable to control or recover your UAV • Operate only one UAV at a time, with a single remote control • Intentionally or as a result of an error, you can no longer meet the exemption requirements if the UAV is in a security or other safety risk • Stay at least 50 metres from the people, animals, buildings, structures, and vehicles not involved in the operation 	<ul style="list-style-type: none"> • Be safe, well trained and know the rules of the air • Be 18 years old • Have at least \$100,000 liability insurance • Be able to read and understand the rules of the air • Fly only in Class G airspace • Do not exceed 100 m AGL and 100 m from any person, animal, building, structure, or vehicle • Carry a radio if you are operating in Class G airspace • Have your UAV in direct line of sight and always be able to see it with your own eyes • Carry a copy of your UAV registration card of liability insurance, contact information, and UAV system features • Have your aircraft in direct line of sight and always be able to see it with your own eyes • Verify that your drone's transmission won't affect control of your UAV • Have an emergency plan ahead of time • Carry a copy of your UAV registration card of liability insurance, contact information, and aircraft identification • Follow the manufacturer's operating and emergency procedures, including those for the remote control loss, should you be unable to control or recover your UAV • Operate only one UAV at a time, with a single remote control • Intentionally or as a result of an error, you can no longer meet the exemption requirements if the UAV is in a security or other safety risk • Stay at least 50 metres from the people, animals, buildings, structures, and vehicles not involved in the operation

DO NOT:

- Fly closer than 9 km from forest fires, airports, military bases, prisons or in a corridor or restricted airspace
- Fly over crowds or higher than 90 metres
- Fly over military bases, prisons or in a corridor or restricted airspace
- Carry dangerous goods or items

tc.gc.ca/safetyfirst 

➤ **Unmanned Systems Canada Web site: UnmannedSystems.ca**

Canadian Experience To Date

- **Model Aviation**
 - Good long term safety record for those who follow the official association guidelines
 - Lots of misuse/challenges by “non-traditional modelers”
- **SFOC system**
 - Cumbersome to review each risk analysis, and results vary by region
 - Provided over 3200 operating certificates (2007-2014)
 - **Great experiential data base on which to base future regs!**
- **Exemptions**
 - Very limited in usefulness
 - Many operators ignore conditions, especially regarding proximity to built up areas (or so it is rumoured....)



Canadian Next Steps

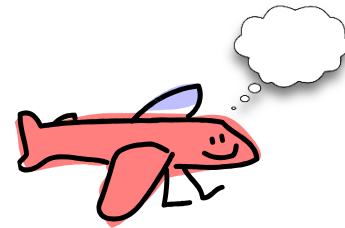
➤ **Notice of Proposed Amendment (NPA)**

- *Using recent experience to build practical, performance based regulations*
- *Focus on small UAS operated within Visual Line of Sight*
- *Comment Period ended August 28, 2015*
- *Regulations expected by mid 2016!*

➤ **Beyond Visual Line of Sight Operations (BVLOS)**

- *“regulation committee” has completed their deliberations*
- *Recommendations are being presented to Transport Canada*
- *Expectation of further announcements in near future*

Thinking on BVLOS



- Base **everything** on risk!
- Only consider what is different between VLOS and BVLOS

Difference	Risk	Mitigation
Ability to “see” obstacles/other airspace users close to aircraft	Flying into other aircraft or overflying obstacles	Define information needs of pilot – NOT THE TECHNOLOGY!
Ability to “monitor” aircraft during normal flight and when things go wrong	Potential Loss of Pilot and ATM Situational Awareness, increasing other risks	Define procedures and information needs for lost link situation. Increase information provided to pilot for routine operations
Ability to interact with other airspace users and ground installations that are local to the aircraft, but not necessarily the control station.	Lack of localized communication is at odds with current aviation – numerous things are managed via this approach	Ensure RPAS communication systems “ mimic ” manned aircraft systems.
Communication and control links between control station and aircraft are longer, may be provided by third parties	Increased risk of “lost link”, thereby increasing the risk of loss of control and situational awareness	Need to develop either minimum standards for these links, or the procedures that occur when the link is not functional

Sense and Avoid Systems

- *Functions recommended by CARAC UAV WG complete (Small RPAS):*
 - Provides a Detect Function – ability to sense*
 - Provides a Separation Function - ability to indicate to pilot*
 - Provides a Collision Avoidance Function – ability to advise pilot and/or take over!*
 - Provides a ‘well clear’ indication*
 - Operates in multi-aircraft conflict scenarios*
 - Provides system oversight*
 - Is compatible with existing collision avoidance systems*
 - Includes ADS-B out*
- *Detection Performance Minima:*
 - Sensor Field of Regard: +/- 180 deg. by +/- 15 deg.*
 - Resolution: Cessna 182 @ (15 + 2T) sec range*

Other BVLOS Requirements

- *Lots of other requirements for:*
 - *Lost Link*
 - *Flight Termination*
 - *IFR*
 - *Ground and surface obstacle detection*
 - *Lighting systems*
 - *Operations/Planning details*
- *Hopefully the full package will be disseminated this November at Unmanned Canada 2015*

Recreational, Model UAS

- *The recreational use of small quadcopters and drones is pervasive*
- *Relatively unregulated, this can be a potential hazard to other users of the airspace and persons on the ground....*
- *If all else fails, it generates “bad press” (and you have all seen this!)*

Recreational, Model UAS

- *Potential solutions:*
 - *Information provided to purchases at point of sale*
 - *Provision of guidelines, information on model aeronautics societies, information on legal responsibilities*
 - *Enforcement of current regulations to highlight the need for compliance.*

Everyone in the industry needs to assist in this effort!

Questions?



Halifax NS, Nov 3-5

- *Will include Commercial UAS, UGV and UMV and regulatory workshops!*
- *New format events to increase business – 2 – business opportunities!*
- *Social events – Halifax is a great town!*